

1920—Our Twenty-Fifth Anniversary—1945

# Contractors and Engineers Monthly

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Covering  
the Field

**Airport Runways**

Woman-power enabled the contractor for new bituminous runways to enlarge a county airport to solve a difficult sub-grade-compaction problem necessitating an unusually large amount of rolling. The story is on this page.

**County Road Work**

Features of a county highway department responsible for the maintenance of 1,225 miles of state and county highways include an efficient organization, a simple effective accounting system, selected gravel pits dispersed throughout the county, and a well run central garage. (Page 2). Other county articles appear on pages 49, 62, and 75.

**Bituminous Paving**

Two types of bituminous road jobs are described in this issue. One is a 2-mile airport access road, consisting of a new 8-inch sand-clay gravel base and a three-course asphalt surface treatment (page 6); the other, resurfacing 4.5 miles of 40-foot concrete highway with two courses of bituminous concrete (page 81).

**Slope Stabilization**

Economical stabilization of road banks to prevent erosion may be secured by encouraging the invasion of local plants and shrubs, thus cutting both first and maintenance costs. (Page 6).

**Seabees' Repair Shop**

The story of a Seabee Battalion snatching machine tools from beneath Japanese noses in order to set up an efficient floating equipment-repair shop on a big dredging project in the Pacific (page 11) is another chapter in the outstanding record of this fighting-building outfit.

**Maintaining Army Roads**

The Army Engineers have had some excellent experience in maintaining roads and runways in continental U.S.A. On page 17 Major Truxas discusses concrete and bituminous maintenance, and reports some interesting experiments.

**Submerged Dredge Line**

To avoid the delays involved in opening a dredge line across the Mississippi for the heavy river traffic, the pipe carrying hydraulic fill for a blanket on the opposite bank was submerged under the navigation channel, increasing the yardage placed by 20,000 yards a day. See page 31.

**Concrete-Pavement Design**

Studies of the life of expansion-joint dowels and of pumping under concrete slabs have resulted in new designs for concrete pavements in New Jersey, including uniform pavement thickness, corrosion-resistant dowels, wood joint fillers, and changes in reinforcing steel. See page 65.

You will find "In This Issue" on page 4.

## Seal Coat Improves Three Rough Roads

### Pre-Treated Aggregate on Bituminous Prime Coat Smooths Old Asphalt and Concrete in Chicago Area

THREE roads, totaling nearly 10 miles in length, in Cook County, Ill., were recently improved under a contract, awarded to the Standard Paving Co. of Chicago by the Illinois Division of Highways, to surface them with a bituminous seal coat consisting of an asphaltic application covered with pre-treated pea gravel. The roads were 0.9 mile along Ogden Avenue in Chicago from Cermak Road westerly towards Cicero; 0.9 mile along Cicero Avenue in Chicago from Kinzie Avenue south; and 8.0 miles on Milwaukee Avenue, State Route 21, northwest of Chicago, from Wheeling southeast to Niles. On the first two city streets, the seal coat was applied to a 3-inch sheet-asphalt pavement on both sides of the Chicago surface-line tracks, in two lanes varying in width from 15 to 17 feet each. The 8-mile section was a 40-foot concrete pavement, the middle 20 feet of which had been resurfaced five years ago with 1 inch of bituminous concrete.

**Applying the Seal Coat**

The Milwaukee Avenue improvement included first the preparation of the base by sweeping the center 20 feet of the roadway with a mechanical sweeper, after which no traffic was allowed on that portion until the seal coat had been completed. Traffic was maintained on the outer lanes of the 40-foot pavement. Pe-

(Concluded on page 35)



## College Girls "Save the Day" At County Airport Project

By FRANK B. SARLES,  
Western Field Editor

A CONTRACT for the improvement of the Sheridan, Wyo., County Airport was awarded by the Civil Aeronautics Administration to Peter Kiewit Sons Co., Omaha, Nebr., in the summer of 1944. This project, financed by funds allotted for "development of landing areas for national defense", provided for the construction, to CAA standards, of two runways, NW-SE and NE-SW, 5,000 feet long and 150 feet wide, to replace two runways built in 1941, as well as new taxiways 50 feet wide with an aggregate length of 11,100 linear feet. Both runways and taxiways received a 5-inch bituminous-concrete base, laid in two courses to a width 2 feet greater than the width of the top surfacing, and a 2-inch

### Aid in Compaction of Granular Sub-Base for Hot-Mix Runway Paving

By Peter Kiewit Sons

surface of bituminous concrete laid 50 feet wide on taxiways and 150 feet wide on runways. The end 200 feet of the runways, however, were given a 2½-inch special surfacing having a ¾-inch maximum aggregate grading, thus providing additional thickness and density to the area used for turning and warm-up pads.

The runways which were replaced under this contract consisted of a 2-inch bituminous top on an 8-inch base and had proved inadequate for the heavy planes using the field. The N-S runway built in 1942 to acceptable standards was not disturbed. Land owned by the County was sufficient for the extension and no expenditure for that purpose was involved. In addition to its wartime use by the Air Transport Command and the Army Air Forces, the Sheridan County Airport is utilized by Western Air Lines in commercial transportation.

Under both taxiways and runways the subgrade was compacted for a 6-inch depth to a modified Proctor ratio of 95 per cent, with the width 4 feet greater than that of the surface. Under the taxiways, 27 inches of granular sub-base was compacted to 95 per cent modified Proctor, and the same depth of sub-base was used under 500 feet at each end of the runways. Under the remainder, the depth of sub-base was reduced to 21 inches. Because of the sandy nature of the binder in the material available for sub-base construction, a great deal of difficulty was experienced in securing the desired compaction, and rolling of the base with both sheepfoot and pneumatic rollers was carried on 24 hours daily 7 days a week. In this essential operation, the services of Sheridan young ladies

(Continued on page 69)



*U. S. Army Signal Corps Photo*  
At an Ordnance Motor Base Shop in the South Pacific, motors are dismantled and rebuilt for additional service. Every effort is being made by the Army and Navy to keep equipment working as long as possible. Can we at home do less?

# **County Highway Dept. Is Well Organized for Effective Maintenance**

**Central Repair Shop, Widely Spread Gravel Pits, and Efficient Accounting for Big Combined Road Mileage**

**By WILLIAM H. QUIRK,  
Eastern Field Editor**

+ THE Road Commission of Ingham County, Mich., is a well directed and organized unit of county government, which it needs to be in order to discharge efficiently a complete maintenance program on the 100 miles of state trunk highways and 1,125 miles of county roads which come under its jurisdiction. Ingham County is one of the fifty-nine

County Road Commission has a good roster of diversified equipment which is kept in first-class operating condition at a modern shop in centrally located Mason. The Commission also makes good use of several county-owned gravel pits which furnish low-cost road-maintenance materials.

## **County Organization**

This fifth largest county in the state, on a basis of population, has a County Road Commission composed of Leroy D. Dunckel, Chairman, and two members, Guy C. Hull and Willard N. Sweeney, who were appointed to a six-year term of office by the County Board of Supervisors. The terms are staggered,



After removing snow from the roads by underbody blades, Ingham County uses heavy blade plows to throw the accumulated snow into the ditch.

districts with the main office and garage at Mason, which supervises new construction as well as maintenance, while the other four locations at Williamston, Lansing, Onondaga, and Stockbridge are concerned only with maintenance. About 110 men are employed at these garages and on the road, which is less than half the number employed before the war. Of this number, 50 work out of the central garage at Mason, 20 each at Wil-

cific allocations for certain roads and a careful accounting is made of the amount of money spent on each job. Employees turn in 4 x 6-inch daily time cards showing where they have been working, the kind of work they were doing, the total number of hours, and their rate per hour. Other 4 x 8½-inch daily summary cards are filled out by the foremen for both men and equipment and the rates listed. A master list in the office indicates

Ingham County Road Commission		MAINTENANCE Only Time Card
Date		19
<b>Address</b>		
<b>TOTAL HOURS</b>		
<b>MAINTENANCE SECTION NOS.</b>		Amount \$
<b>SUPPLY, USED</b>		
<b>A- ROUTINE SURFACE OPERATIONS</b>		
1	Patching, etc. incl. Base repairs	
2	Draping (Wooling)	
3	Curb Filling, etc.	
<b>B- SPECIAL SURFACE OPERATIONS</b>		
1	Soil Pollution	
2	Ground Remedies, etc.	
3	Resurfacing or repair of agg., etc.	
4	Bituminous Surface Treat., etc.	
5	Mud-Loaking	
<b>C- SHOULDER &amp; APPROACHES</b>		
1	Patching, Wading, etc.	
2	Reseeding and Reseeding	
<b>D- DRAINAGE &amp; ROADSIDES</b>		
1	Excavation Control and cap	
2	Repair, Drain, Distress & Break.	
3	Grass, wood, etc. roadside cleanup	
4	Tree Trimming	
5	Roadside Plants—Routine	
6	Roadside Plants—Special	
7	Repair Culverts, roadside walls, etc.	
<b>E- TRAFFIC SERVICES</b>		
1	Guard Rail	
2	Street-Paving	
3	Marks & Signs	
4	Persons marking	
5	Traffic signals & highway lights	
<b>F- SNOW, ICE &amp; SAND CONTROL</b>		
1	Snow Plows—excavators, etc.	
2	Snow Removal	
3	Ice Control	

Ingham County Road Commission		• MAINTENANCE Daily Equipment Time Card	
Date		99	
Name of Equipment			
Equipment No.			
TOTAL HOURS		RATE	
MAINTENANCE SECTION NOS.		Amount \$	
EQUIP. USED			
<b>ROUTINE</b>			
<b>A- SURFACE OPERATIONS</b>			
1 Patching, etc. incl. Base repairs			
2 Dredging (Blasting)			
3 Crack Filling, etc.			
<b>B- SPECIAL SURFACE OPERATIONS</b>			
1 Dust Pollution			
2 General Resurfacing, etc.			
3 Re-shape, or rekey, oil app., etc.			
4 Bituminous Surface Treat., etc.			
5 Mud-Jacking			
<b>C- SHOULDER &amp; APPROACH'S</b>			
1 Patching, Blasting, etc.			
2 Reseeding and Resodding			
<b>D- DRAINAGE &amp; ROADSIDE</b>			
1 Erosion Control and reefs			
2 Repair, Dredge, Ditches & Street.			
3 Grass, wood cut, roadside cleanup			
4 Tree Trimming			
5 Roadside Maint.—Rustics			
6 Roadside Maint.—Special			
7 Repair Sidewalks, retaining walls etc.			
<b>E- TRAFFIC SERVICES</b>			
1 Guard Rail			
2 Sewer-Plumbing			
3 Markers & Signs			
4 Pavement marking			
5 Traffic signals & highway light.			
<b>F- SNOW, ICE &amp; SAND CONTROL</b>			
1 Snow Force-eration-dismant.			
2 Snow Removal			
3 Ice Control			

The forms used by Ingham County, Mich., to record the working hours of men and equipment on both construction and maintenance. These cards are turned in daily and furnish information for the careful accounting system which covers expenditures on both county and state highways.

of Michigan's eighty-three counties which have a contract with the State whereby the County performs all maintenance and is reimbursed 100 per cent by the State for the care of the state trunk highways which traverse the county. To carry on this work, the

with one appointment every two years, so that the entire personnel of the Commission is not changed at once. The engineering work is under the direction of E. E. Ferris, Acting County Engineer and Superintendent.

The county is subdivided into five

liamston and Lansing, while the remaining 20 are divided between the other two shops. A foreman, who is encouraged to use his own initiative and accept responsibility, is in charge in each district.

The 1,125 miles of county roads in Ingham County are divided as follows:

Bituminous roads	517 miles
Gravel roads	497 miles
Bituminous streets	25 miles
Gravel streets	79 miles
County concrete roads	7 miles
	1,125 miles

This does not include the 100 miles of concrete state trunk highways.

## Budget Accounting

A contract whereby the County maintains the 100 miles of state highways in Ingham County and is reimbursed by the State is arranged between the Michigan Highway Department District Engineer and the County Engineer. A budget is drawn up for the work to be done within the county in a given year, and covers sealing cracks, patching, surface treatments, ditching, and other types of maintenance. After this budget, which was \$163,000 for 1944, is approved by the Michigan Highway Department authorities at Lansing, it is up to the County Engineer to operate within its limits and do the work called for.

The budget is broken down into spe



Dagham County uses its Pioneer Duplex 33V portable crushing plant to work the Whitman gravel pit in Delhi, Mich.

the rate per hour that is to be charged for each piece of equipment. Gas and oil are similarly checked against each job with a 4 x 6-inch card system. One feature which has proved helpful is a 4 x 6 inch card for each drainage structure in the county, on which alterations, such as raising or lowering a grade, are recorded.

No new construction was undertaken by the County during 1944 because of the war, but when construction is in progress a careful accounting is kept of men and equipment with a card system similar to that used in maintenance work.

### Road Maintenance

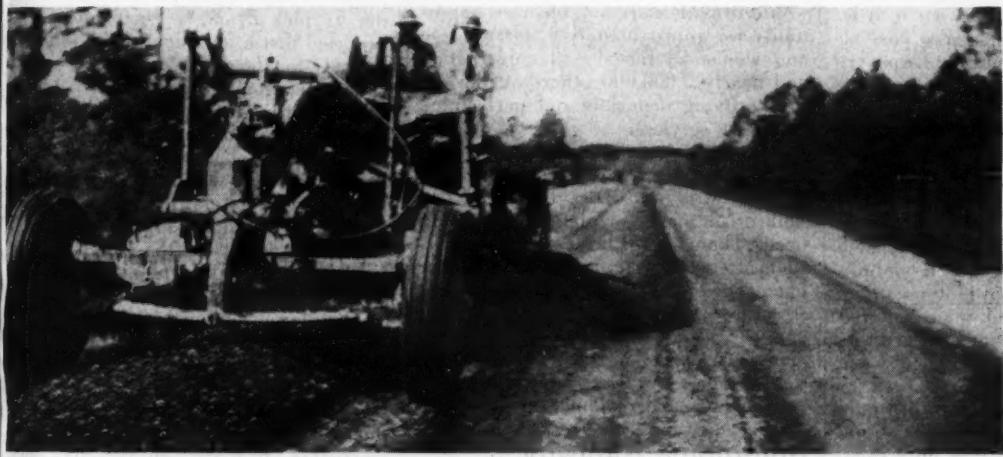
A labor shortage last year forced the County to abandon its usual practice of doing all maintenance work with its own forces and to award contracts for about \$40,000 to cover some concrete patching on state highways. A truck shortage compelled the County to ask for bids on the processing of 100,000 cubic yards of gravel to be taken from either county-owned or county-leased pits. Fifteen county trucks have been laid up for need of repairs as there are not enough mechanics available to work on them. No new trucks can be purchased because of

# Stage construction with Asphalt

spreads Road Building costs  
over the years



**1** In the beginning, surface-treatments with Texaco Asphaltic products at intervals of one or more years provide a satisfactory road surface.



**2** When required by increased traffic, a low-cost Texaco pavement of the road-mix or plant-mix type may be placed on the existing road.



**3** Eventually, a heavy-duty Texaco pavement of the Sheet Asphalt or Asphaltic Concrete type may be constructed without disturbing the old road.

It is sound road building practice to improve roads and streets by stages, as dictated by the needs of increasing traffic. This desirable policy is readily effected through the use of Texaco Asphaltic products.

Starting out with an adequate, well-drained macadam or gravel base, surface-treatments with Texaco Surfacing Material at intervals of one or more years provide satisfactory service while traffic is light. When a higher type surface becomes necessary, add to the existing road a low-cost pavement of the road-mix or plant-mix type, using the recommended grade of Texaco Surfacing Material and inexpensive local aggregate. Eventually, when traffic demands a heavy-duty pavement, a durable Texaco Sheet Asphalt or Texaco Asphaltic Concrete wearing surface may be constructed, without disturbing the old road.

By employing the stage construction method, traffic is adequately served at all times. Each succeeding improvement becomes an integral part of the final pavement. The entire cost of the project is spread over many years.

Texaco Engineers, who are Asphalt specialists, will be glad to discuss with you the applicability of stage construction to your own roads or streets. Write our nearest office.



THE TEXAS COMPANY, Asphalt Sales Dept., 135 East 42nd St., New York City (17)

Boston (16) Chicago (4)

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Philadelphia (2)

Richmond (19)



# TEXACO ASPHALT

# Contractors and Engineers Monthly

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## Motorists Pay Too Little Attention To Diversion of Gas-Tax Revenue

Governor Tobin of Massachusetts has suggested a one-cent-a-gallon increase in the state gas tax to bolster Bay State finances. At hearings of the Taxation Committee, his program received a terrific mauling at the hands of the organized motorists of the state, including the automobile clubs both individually and as federations, the trucking interests, the State Grange, the gasoline dealer groups, and other organizations. Since the increase would raise the tax only from three to four cents, it would have little effect on the volume of motor traffic in post-war years. What is astounding, however, is the very slight recognition given to the question of diversion by those making the protests.

Not many years ago Massachusetts was threatened with the withholding of Federal Aid because of increasing diversion of gas-tax revenue by the politicians to other than highway purposes. If the Bay State, which has had a well organized, efficient state highway department with a succession of outstanding Chief Engineers, did increase its gas-tax rate to four cents and at the same time passed an anti-diversion constitutional amendment, the taxpayers would

be assured of a well administered highway construction program that would place the commonwealth far in the lead in highway transportation facilities.

On the other hand, if the politicians would leave the gas tax just where it is, and give the voters a chance to pass an anti-diversion amendment, the taxpayers would still be benefited by the application of all gas-tax funds to highway work.

The Springfield, Mass., Union recently commented thus on the situation in that state, "It should be kept in mind that when the state gasoline tax was originally set up it was under the pretext that the money derived would be devoted only to highways. There was less objection to this on the part of motorists than might have been raised if it had not been accepted in the same sincerity in which it was doubtless intended when the tax was levied."

"It was not foreseen how easy it would prove to dip into this gasoline-tax fund to meet other state expenses until eventually the original intent of the tax was lost sight of and the millions made available by the tax came to be looked upon simply as a reservoir from which other needs could be met."

## Speak Up or Shut Up!

Complaining, non-constructive criticism, or griping, in the G. I. vernacular, is a common American trait. The only trouble is that when John Doe grabs Richard Roe on the street and starts telling him what a mistake it is for the engineers to locate the new expressway via Sixth Street instead of along Twenty-First Street, while he may have a really concrete acceptable reason for the change, he is wasting his breath on Richard who has no more to do with the location than poor John.

To let the gas out of inflated grippers, as well as allow honest intelligent citizens to offer constructive suggestions, the Chamber of Commerce of Atlantic City is holding monthly "town meetings" on the subject of the proper location of a New Jersey state highway in which the seashore resort has a legitimate interest.

Here is what the Atlantic City Press had to say in a recent editorial: "It is well known that some local citizens whose selfish public interest never has been questioned disagree in large degree with directional programs of both the State Highway Commission and the local Planning Board. They think the State is still building roads that go nowhere—merely knitting together the farms of favored constituents.

"They hold City Planners dawdle with pier fairylands and neighborhood parks when they should be yelling from the rooftops for an ocean boulevard that would be a seashore parkway, à la

New York and Connecticut.

"But such dissenters need to keep silent, or depend only on the newspaper forums, no longer. The Chamber of Commerce is holding 'town meetings' monthly and inviting specific speech making. They started with State Highway Commissioner Spencer Miller. Next will come an engineer who'll talk on other plans. Certain citizens will be asked to follow him with five-minute expositions.

"Then every citizen present will be 'dared' to fire questions or verbal brickbats. It looks like a first-class public service."

Here is an idea that any state highway commission, county highway commission, contractors' organization, or civic group can foster to the benefit of all.

## Engineers Now Have Own 3-Star General

The Corps of Engineers, U. S. Army, now has for the first time in history a 3-star general as Chief of Engineers. General Eugene Reybold, who has been Chief of Engineers with the rank of Major General since October 1, 1941, was recently made a Lieutenant General.

All construction men and engineers throughout the country welcome this merited promotion of the man who has trained the Army Engineers and has been responsible for over \$11,000,000,000 of construction.

## War Is Not Won Yet, But Plan for Future

In a recent statement, Harry A. Dick of Portland, Ore., President of the Associated General Contractors of America, urged that the planners of America prepare for post-war construction. Not neglecting the needs of the fighting fronts, which must come first, Mr. Dick stated, "It is much easier to gear our business economy to war than it is to shift it back into prosperous peacetime operations. The reconversion period will bring many problems for our business economy. High among these problems will be employment, and to provide sufficient employment will require planning."

Pledging increased effort by the Associated General Contractors for advance planning for the post-war period, Mr. Dick said, "We on the home front would be derelict in our duty to our fighting forces, if we did not plan for the day of their return home and reentry into civilian life."

The AGC has been campaigning for the planning of post-war construction to the contract-letting stage since early last year. The general goal of the campaign is to stimulate advance planning of projects sufficient for a rate of construction of \$12,000,000,000 annually by the end of the first year after the war, which would provide work and business opportunity for approximately 2,400,000 men and women at the site of construction and nearly 5,000,000 others off the site in supplying materials and performing necessary services.

"Forethought and planning are as necessary in building for peace as in building for war," Mr. Dick declared. "In both it is a matter of planning to meet a need. The need for large-scale construction after the war is obvious—better homes, better industrial and commercial structures and facilities, better highways, new air terminals, and huge developments of various kinds for better utilization of our natural resources, as rivers and harbors and reclamation projects."

## Housatonic Highway Hearings Being Held

Hearings are being held by a committee of the Connecticut State Legislature on a bill for the planning of a scenic highway following the course of the Housatonic River from Long Island Sound north to the Massachusetts border. This project through scenic country has been compared to the Skyline Drive along the Blue Ridge Mountains of Virginia.

The bill, which is under consideration by the Roads, Rivers, and Bridges Committee, does not grant authority to proceed with construction of the highway but would permit the State Highway Department and the Park and Forest Commission jointly to prepare working drawings and specifications.

## In This Issue

Airports	1
Bituminous Paving	1, 6, 81
Bridges	39, 44
Care of Equipment	37, 55, 77
Concrete Paving	25, 65
County and Town Road Work	2, 29, 49, 62, 73
Dredging	31
Editorials	4
Equipment Shops	2, 11, 37
Flood Control	31
Highway Design	65
Highway Maintenance	1, 17, 25, 89
Legal Decisions	23
Plans for Post-War Work	4, 28, 29, 43, 44, 49, 62, 68, 72, 75, 85, 86
Portraits in Print	7
Roadside Development	6, 59
Safety	55, 74, 77
Seabees	11, 34
Slope Stabilization	6
Surplus Equipment Disposal	4, 14
Timber Construction	39

## Tool Industry Gets Surplus Sale Plan

The first surplus sales plan for a complete industry to be approved generally by both Government agencies and the industry and which may serve as a model for the disposal of other surpluses has been arranged through contracts between the Defense Plant Corp. and the Reconstruction Finance Corp. on the one hand and the Cutting Tool Manufacturers on the other. The plan has been approved by the Department of Justice and the Surplus Property Board and it is reported that a modification of the plan is ready for the disposal of surplus radio communication equipment.

The cutting-tool plan, as approved, follows in outline the one proposed by the Cutting Tool Manufacturers Association after the so-called "tool scandal" in Detroit. Under this plan, the manufacturer who originally supplied the tools will act as agent for the Defense Plant Corp. in disposing of surplus tools through normal trade channels.

The plan is designed to speed tool disposal in an orderly fashion, eliminating speculation, by requiring the sale of a minimum of one surplus tool for every three new tools of the same type produced by that manufacturer. There is no restriction, however, on the maximum proportion. Through cooperation of the original manufacturer of tools, efficient segregation into several classification is provided: for immediate resale, for reconditioning, for alteration, and for scrapping.

Among provisions of the plan are an allowance to manufacturers of appropriate charges for handling, reconditioning and storage. It is understood that provision is also made for allowing normal trade discounts to distributors and other trade channels by the manufacturer in selling the surplus tools.

As a further insurance against increase in surplus tools, orders for new tools by the United States Government or its branches will be filled first from such stocks of surplus tools as are available from the manufacturer-agent.



*British Combine Photo*

The Manchurian road which follows the route of the British 14th Army's 10-month advance on the road to Mandalay. Bituminized strips form a permanent surface to withstand the torrential rains and blazing tropical suns.

# THERE'S PROFIT IN A "STANDBY" SEAMAN MIXER



Sunday, February 4, 1945

Seaman Motors,  
Milwaukee, Wis.

Gentlemen:

Dear Sirs:

Here in the Southwest Pacific, soil is the only road and runway material. My task with the Army Engineers is roadway and runway design. Men of other units have had copies of your Bulletin C-24 in their possession. It answers many a question that confronts me. Are copies of the Bulletin available at this date? If so, would you forward two copies to the address listed below. Certainly they would be appreciated.

Very truly yours,

5/5/45  
H.C. 934 Eng. Comt. Gp. (Av.)  
APO 322 P.M. San Fran

P.S. Air mail would save two months in mailing time.



LEFT—Fleet of Seaman Mixers on airfield project. CIRCLE—Typical "job-use"—repair of small section of secondary highway.

## Highway Departments, Road Construction Contractors and Airfield Operators Often Find an EXTRA Seaman is Essential.

There is "project-use" and then there's "job use" for the Seaman Mixer,—and there's a sharp difference between them! In project-use,—the construction of large sections of roads, runways or extensive parking areas,—often a fleet of Seamans will be kept busy . . . Job-use, on the other hand, might well include the repair of stabilized or bituminous roads, shoulder widening and stabilization, leveling rough or uneven areas on turf airfields, preparing roadside mulches and grass seedbeds,—clearing land of brush, roots and weeds and pulverizing hard, frozen snow drifts on highways and airfields,—to name but a few. Notice that those are all jobs that often occur where larger work may be keeping the regular Seaman Mixer busy. And if a "standby" Seaman is not on hand, those are jobs that either will be left unattended—or performed by less efficient, far more costly methods.

So, from now on,—get an extra profit with a "standby" Seaman Mixer.

**THANK YOU, Sergeant—WE'RE GLAD TO BE OF HELP!**

It has been the steadfast policy of Seaman Motors to provide practical current engineering information to those in the highway and airfield construction field. Such information is by no means restricted to the use of the Seaman Mixer but concerns itself with any phase of such construction which appears to be of value. Letters such as these are gratifying,—for we feel that our effort to render an "extra service" is of practical use.

C-108



**SEAMAN MOTORS**

Milwaukee 3, Wisconsin

# Asphalt and Gravel Used for Access Road

## Three-Course Treatment Put on New 9-Inch Gravel Base for 2-Mile Contract To De Ridder Fighter Base

W. R. ALDRICH & Co., Baton Rouge, La., contractor, has reconstructed the 2.06 miles of U. S. 190 from the town of De Ridder, Beauregard Parish, in southwestern Louisiana to the entrance to the De Ridder Fighter Base Field located southwest of the town. The project, known as the De Ridder Airport Access Highway, was built under the supervision of the Louisiana Department of Highways and paid for entirely with Federal funds. The new road consists of a 9-inch compacted sand-clay-gravel base course which was given three applications of asphalt and gravel surface treatment for a width of 20 feet. For a distance of 700 feet inside the town limits of De Ridder the new road has a width of 37 feet. The old road had an 18-foot stabilized-gravel base about 4 inches thick, built in 1930 and badly worn from wartime traffic between the town and the airport.

The old road, which was used as a base for the new surface, was first broken up by the five 7-inch scarifier teeth on a Caterpillar No. 12 motor grader. The new base course was laid over the utility manholes in order to get better and more uniform compaction over the entire gravel base. Their locations were spotted and tied in so that they could be uncovered later and raised to the new grade. The raising of the manholes was done by the contractor.

### Sand-Clay-Gravel Base

The sand-clay gravel used in the base course is known as B-modified gravel in Louisiana highway specifications, and contains from 12 to 25 per cent of clay, 40 to 50 per cent metal (gravel), and the remainder, sand. The specified gradations were as follows:

Material	Screen Size	Per Cent Passing
Metal	1½-inch	95-100
Metal	No. 4	50-60
Sand	No. 10	35-50
Sand	No. 40	20-40
Clay	No. 200	12-25

The gravel was purchased from the Ross Sand & Gravel Co. at Cravens, La., and shipped 30 miles in gondola cars over the G. C. & S. F. railroad to a siding near the air base where it was unloaded by a Koehring 501 crane with a 40-foot boom and an Owen 1-yard clamshell bucket. Whenever possible the cars were unloaded directly into trucks which made an average haul of ¾ mile to the road. One man worked in the cars cleaning up the gravel during the unloading, while another leveled off the trucks. The

gravel which could not be used at once was stockpiled at the siding. Six rear-dump trucks, three Fords and three Internationals, with a capacity of 4 cubic yards each, hauled the material.

The gravel was laid in three layers for a total loose depth of 12 inches which compacted under rolling to 9 inches. In order to maintain traffic on the existing road, the trucks unloaded the gravel in piles down one-half of the road, leaving the other half unobstructed for traffic. The gravel piles were about 10 feet wide and spaced 11 feet apart with about 36 cubic yards per station for the first course. A Caterpillar power grader knocked the piles down and spread them out over the road to a uniform depth, working with its blade set at a 45-degree angle. Several trips over the road with the grader were necessary before the gravel was properly spread. It was then rolled by a Grace smooth-pneumatic-tire roller, with four wheels in front and six in back, weighing 1½ tons, and pulled by a rubber-tired International tractor.

During the laying of the base, the sand-clay gravel was kept at from 8 to 10 per cent moisture content, with water being added when necessary from an 800-gallon gravity tank truck equipped with an 8-foot spray bar. If too wet, time had to be allowed for the gravel to dry out before it was compacted; if the base contained too much moisture it would sink and spread, while if it were too dry it would crack and begin to ravel. The base course was thoroughly compacted and "cured" through the use of a 1½-ton pneumatic-tire roller.

The second course of gravel was laid in a similar manner but the piles along the road were spaced a little farther apart, since this layer consisted of only 30 cubic yards to the station. After rolling, a third course was put down at the rate of 20 cubic yards to the station with a still wider spacing of piles along the road, and was likewise rolled. The finished base had a 9-inch thickness for 22 feet which feathered off to 0 in 3 feet on each side. The base was shaped to the desired cross section with a 4-inch crown. A total of 9,464 cubic yards of sand-clay gravel was used.

During the laying of these courses the sand-clay gravel was tested both in the field and laboratory and, if found deficient in metal content, washed gravel was added to meet the grading specifications. The washed gravel was spread from the tail-gate of a truck on top of the sand-clay-gravel base which was scarified to loosen the surface compacted by the rolling. This process is called "sweetening" the gravel. The power grader then mixed the materials together by blading the gravel back and forth.

(Continued on page 60)



U. S. Forest Service Photo

One winter of frost action and erosion changed this once neat bank into a problem spot on a main highway. A growth of local vegetation would have prevented this.

## Plants, Shrubs, Trees In Slope Stabilization

### If Design and Construction Men Will Cooperate With Nature, They Can Be Sure of Good Growths on Road Banks

By CHARLES R. HURSH, In Charge, Water Resource Management Research, Appalachian Forest Experiment Station, U. S. Forest Service

WHEN it comes to vegetation along a country highway, the public would rather see a natural countryside effect,—briers, local native shrubs, some black-eyed susans and cornflowers. These plants are also the highway engineer's greatest aid for road-bank naturalization and permanent soil stabilization. In addition, they blend the roadside into the landscape. Local plants are ready to assist but, apart from the landscape men, very few highway engineers have ever stopped to consider how to help the local vegetation get started and make a go of it.

Generally, local plants are handicapped rather than aided by present construction practices. The road designer figures that bank naturalization is not his job. So does the construction engineer. Certainly they can make it tough on the landscape engineer if they ignore any responsibility for the problem.

Highway engineering is a precision

The time and labor required for such slope manuring as is shown at the left amount to about ten times that necessary to prepare a bank for the growth of local vegetation. In the photo on the right, some topsoil and brush provide a place for seeds to germinate and become established, thus preventing erosion to which the bare slope at the left will be subject.

U. S. Forest Service Photos



# Portraits in Print

By BILL QUIRK

## Charles W. Smith, Florida Contractor, Operates Own Shipyard at Pensacola

IT was 8 a.m. The morning shift had just started work at Smith Shipyards, Inc., and the insistent din of whirring machinery filled the air along Bayou Chico, an inlet of Pensacola Bay 2 miles west of the city. A big locomotive crane was transferring the steel ribs of a ship from the platens, where they had been welded, to the launching ways for assembly, when suddenly a young-looking man in a brown windbreaker who was passing dropped to one knee beside the crane, studied the moving parts for a moment, and then spoke to the operator.

"I just heard a squeak in the driving gear," the voice was soft and musical. "Will you put a little more grease in the bearing?"

"Yes, Mr. Smith," answered the operator, "I'll have it done right away."

"Thank you," came the polite reply. Then striding briskly on for a rapid survey of the yard he explained, "Can't risk having any machinery breakdowns to hold up progress on these ships."

Concentration on machinery has always been a strong point with Charles W. Smith, one of the South's most prominent contractors, and his recent activities in the ship-building business have not caused him to lessen this attention to details in the care of equipment. Besides owning a shipyard, he also heads the Smith Engineering & Construction Co. which has probably laid more yardage of asphalt on southern roads and airport runways than any other single contractor in America. His road-building equipment alone was recently appraised at close to a million dollars, based on current prices less depreciation, and includes 256 pieces of equipment, in addition to over 100 trucks.

Charles W. Smith, or "Chuck" as he is called by his associates, would probably be mistaken for a motion-picture actor instead of a contractor. He is a good-looking man of 41 with thick, black hair, blue eyes, and a ready smile which discloses even white teeth. Years of high school and college sports have given him an athletic build—he is a rugged 180-pounder at 5 feet 10½ inches—and the abstemious routine of training left its impress so that today Smith is a non-smoker and in the one-highball class. He dresses casually in slacks and a slip-on sweater topped by a suede windbreaker. This informal attire permits him to get away from office routine, clamber around on the ships, and keep in close personal contact with his 700-odd workers and all phases of ship construction.

### Road Builder to Ship Builder

"This work was all new to me," Smith related in the quiet, relaxed speech of one born in Georgia. "I knew next to nothing about ships and then suddenly began building them. During the last war, ships were built in this yard and a few keels continued to be laid up until 1930 when the place closed. Pensacola wanted some additional industry rather than be almost wholly dependent on the Naval Base for its livelihood but was unsuccessful in an attempt to attract a submarine-building concern. When the nation began girding for war in 1941, the time looked ripe for a ship-building revival. Some outside promoters operating on a shoestring came down here, talked some people from Miami into backing them, and got a Navy contract for building ships. They knew nothing about ship building; their methods of financing were unsound, the production schedule lagged considerably, and the following year the Navy revoked the

Ship Docks which carry amphibious equipment."

With untiring energy and the organizing ability gained from years of contracting, Smith reorganized the shipyard, repaired the old buildings, and built some new ones. While the work is different from road or airport construction, the delicate problem of handling labor is pretty much the same in all types of industry, and this is where Smith is particularly strong. He spends a lot of time in the yard where he is known to all his workers, and waves, nods, or says hello to them as he passes. Anyone can approach him for any reason and is assured of a patient and polite reception. Besides these daily contacts, Smith holds a weekly meeting with his six superintendents and the general manager in his plain office in the one-story wooden administration building at the yard. Here he greets his men, inquires about their families, and listens to the yard problems which are confronting them. They discuss their work freely, holding back nothing from the



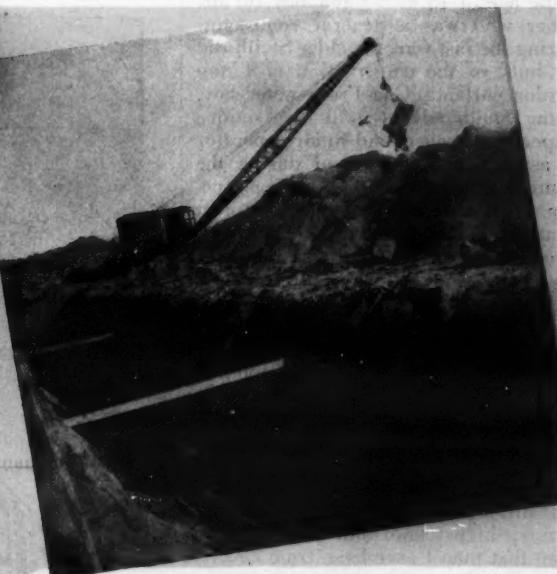
Charles W. Smith, President of Smith Engineering & Construction Co. and Smith Shipyards, Inc., Pensacola, Fla.

"boss". Smith thus gets a perspective on all the departments of his organization and has a stenographer take notes

(Continued on next page)

**24 REASONS  
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THEW SHOVEL CO.  
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# Charles W. Smith, Road, Ship Builder

(Continued from preceding page)

on the conference for future reference.

After nearly an hour of discussion, during which everyone has his say, Smith briefly summarizes the problems which were stated, outlines a course of action, and the superintendents return to work with the feeling that they are all pulling together to turn out ships as fast as they can.

Smith has always preferred working for himself rather than for others. Soon after he became receiver at the shipyard he bought out the former backers so that now the Smith Shipyards, Inc., is owned by the Smith Engineering & Construction Co.

## Contracting Family

Smith was born in Atlanta, Ga., and got started in the contracting business at the age of 15 as a water boy for his father who was a general contractor. During the last war, the elder Smith did the bulk of the construction of Camp Gordon, Atlanta, Ga. From water boy, young Smith advanced to blacksmith's helper, timekeeper, and finally operator of asphalt equipment, and during the summer of 1920 worked on the construction of an asphalt distributor. The next summer he operated the distributor on a road in Tennessee. Happy high-school days were spent at Boys High in Atlanta where Smith was president of the senior class of 1921.

"They were wonderful days," Smith reflected. "I played baseball, football and basketball, and I still feel that the greatest satisfaction I got from life, besides my wife and family, was playing baseball and hearing my bat ring like a bell after connecting for a solid base hit. I played second and third base through high school and got more fun from that than I ever have from closing a big deal as a contractor. Father stressed the development of a strong body, with honesty and character and an average mind, rather than brilliance. That was all right with me, for I enjoyed playing games."

Smith continued his schooling with the study of civil engineering, first at Georgia Tech for a year, and for two additional years at Cornell in New York State. During his sophomore year Smith suspended his education to help his father who was in financial difficulties in his contracting business. He resumed college again but was forced to leave at the end of his junior year when his father's contracting business fizzled out completely. Father and son then went to Daytona Beach, Fla., where the real-estate boom was on, and ran a small business listing and selling real estate. Like everyone else, they made money through the summer of 1925 but went broke in the autumn when the bubble burst and the real-estate boom collapsed.

## Back to Work

"I then put the overalls on and went back to real work," said Smith, "driving an asphalt distributor for the H. E. Wolf Construction Co. of St. Augustine, Fla., which had been building lime-rock-base roads for years, but which got some asphalt contracts and knew little about that type of work."

Within three months Smith had organized the asphalt-surfacing outfit and was made Superintendent at a small salary but with a percentage of the profits. In four years the company surface-treated 6,000,000 square yards of Florida roads while Smith was earning enough money to send his younger brother to the University of Georgia and his two younger sisters to the University of Kentucky, and helped his father get a fresh start in the real-estate and insurance business.

In 1929 Smith formed the Smith Engineering & Construction Co. with two partners from Jacksonville, Fla., who put up some money but did not take an active part in the business. Partial pay-

ment was made on an asphalt distributor, and Charles W. Smith, with his younger brother Shelby, as Superintendent, embarked on a contracting career doing small surface-treatment jobs in Georgia and Florida. While on a small job near Tallahassee, Smith met the beautiful Carroll Grantham of Tampa, who was attending the Florida State College for Women, and right away decided he wanted to surface-treat roads in that vicinity and nowhere else. This being impossible, Smith kept returning to the Tallahassee campus during Carroll's junior and senior years at every opportunity between and during his other contracts.

On one of these visits he met an asphalt salesman, R. L. Bannermann, former District Engineer of the Florida State Road Department, also living in Tallahassee, who was promoting a new low-cost type of pavement, a sand-bituminous road-mix, using a cut-back asphalt and native soil. Glad of an opportunity to stick around Tallahassee, Smith enthusiastically visualized the

possibilities of this pavement. Bannermann was sound in his theory of mix but was weak in how to combine his ingredients. Here Smith's construction-equipment experience was invaluable. He bid on and got a job to pave with sand-asphalt 160,000 square yards of runway at Corry Field, Pensacola Naval Air Station.

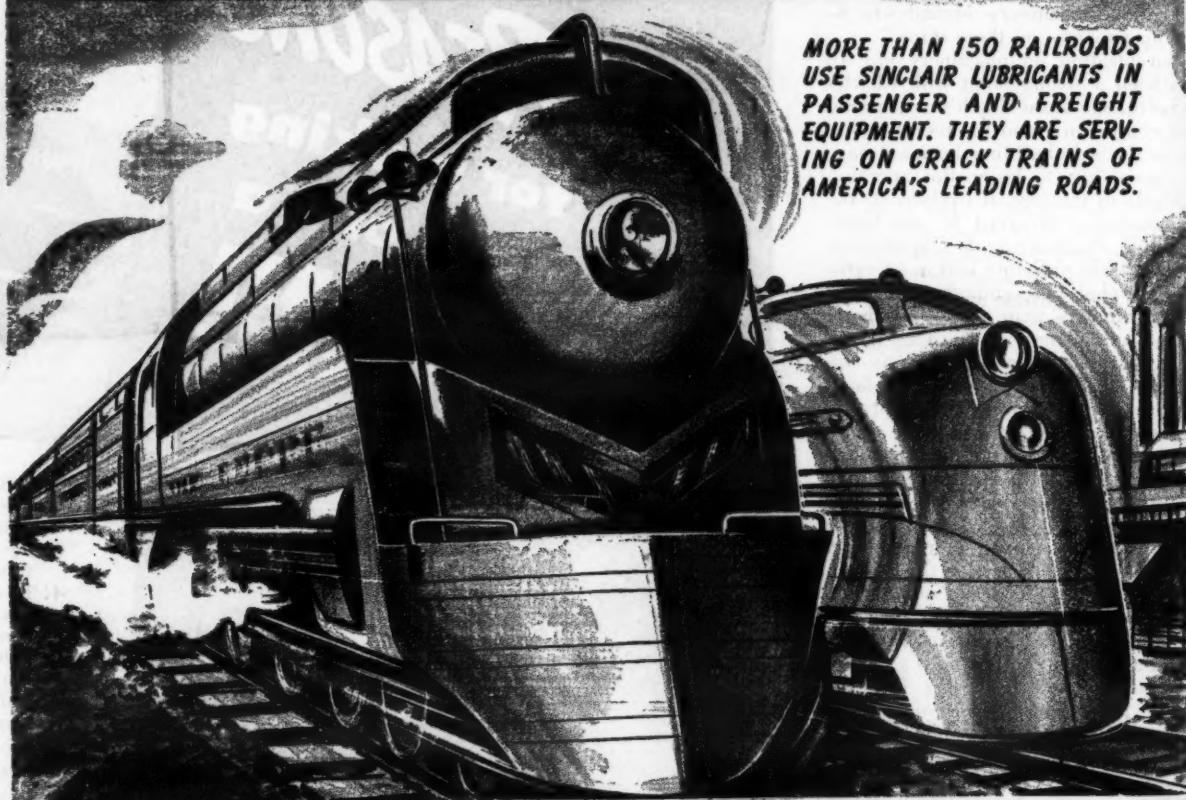
## Sand-Asphalt Pavement

"We built this first job in 1931 with light farm equipment," Smith explained. "We mixed asphalt at the rate of 4 to 5 gallons to the square yard into the native sand with disk harrows, spike-tooth harrows, road graders, and Caterpillar tractors using cleated grousers. There was a future for this type of pavement if it could be built cheap and fast enough, but this early equipment was not right. Grader wheels, for instance, would bog down in the soft sand. We overcame that by putting on wider rims and then the manufacturers installed rubber tires. To aid in getting

(Continued on page 41)

## Do you know that . . .

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USE SINCLAIR LUBRICANTS IN  
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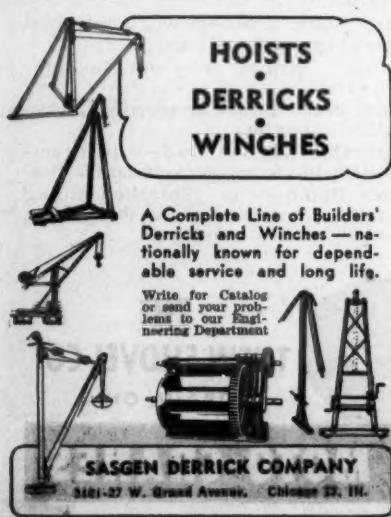
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Hydron absorptive form lining is flexible and is easily stripped.

### Absorptive Lining For Concrete Forms

The development of absorptive lining for forms used in concrete construction, especially for dams, lock walls, fuel storage tanks, and flood walls, has greatly improved the surface characteristics of the concrete. Both surface durability and better appearance are natural results of using absorptive form lining, since one of the factors causing porous and poor-appearing concrete surfaces is the presence of excess water against the form during the initial curing period.

United States Rubber Co. is producing Hydron, a special absorptive paper board faced with a ply of light-weight processed cotton sheeting. The sheeting comes directly in contact with the concrete and facilitates removal of the paper. Being only 1/16 inch thick, Hydron is quite flexible and can be used on curved and warped surfaces. The sheets are furnished in 4-foot widths and in 4, 5, and 6-foot lengths.

The details of the action of this form lining are of interest. Fine cement particles migrate with the mixing water towards the lining during the absorption process and the air bubbles that usually collect at the forms are displaced by this action. Naturally, low water-cement ratios produce optimum results because of the fixed absorption capacity of the lining. The increased density due to the migration of the cement can be accounted for to a depth of at least an inch and, because of the graduated effect, there is no distinct plane of separation from the bulk concrete. This case hardening produces greater resistance to the effects of weathering and abrasion, together with a surface free of the usual blemishes such as voids and sand streaks. No change in the usual amount of vibration is necessary.

Hydron is applied to the forms by means of a rapid-fire staple gun using staples with 3/8-inch legs and crown. The staples are spaced approximately on 6-inch centers in staggered rows throughout the body of the sheets and 2 to 3 inches apart across the seams and along the top and bottom edges of the forms. Cutting or trimming is easily accomplished with shears or a sharp linoleum knife, which means that tie-wire holes or any subsequent fitting presents no problems. Experience has shown that two men can mount about 250 to 300

quantities required.

When the forms are removed, the lining remains on the concrete. Usually it is stripped off within 48 hours although several users have preferred to leave it on for as much as three weeks. In this way it protects the surface during the curing period and aids in providing better distribution of curing water. Removal can be accomplished by stripping it off in one piece or in narrow strips, depending on the pull required. If the lining is wet down or soaked, removal is quite easy even after it has been on for two weeks.

Further information on Hydron and technical service for new users can be obtained by writing direct to the U. S. Rubber Co., 1 Market St., Passaic, N.J.

### Equipment Production Closely Follows V-E Day

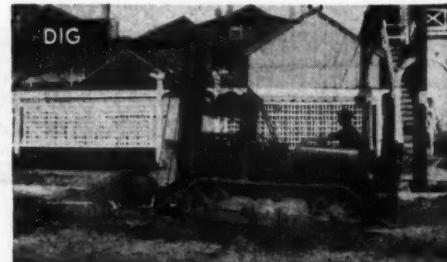
A total of seventy-two industries were listed by the War Production Board on May 5 to receive priority aid in securing machine tools and construction essential

to reconversion. Automobile manufacturers rate first with \$50,000,000 worth of tools and \$35,000,000 worth of construction followed by \$75,000,000 for the retooling and construction needs of the other seventy-one industries.

An AA-3 priority rating has been granted to these industries, which include construction equipment production, immediately following the automobile manufacturers to enable them to get into operation promptly now that V-E Day has arrived. WPB officials stated that this will "reduce the time lag between the cancellation of war contracts and the start of actual peacetime construction."

After learning that passenger automobiles are first in the group of industries, construction men will welcome the list of construction machinery which is next to be made available. It includes tractor equipment, bituminous equipment, concrete equipment, centrifugal pumps, crushing equipment, graders, cranes and shovels, road rollers, track-laying tractors, and miscellaneous construction machinery.

square feet of Hydron an hour. The material costs vary between 4 1/4 to 5 cents a square foot, depending on the



Traxcavator digging up old street surfacing in a Virginia town.

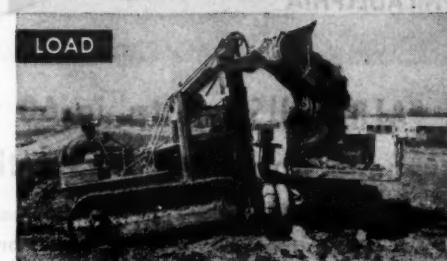


Traxcavator grading between lanes on U.S. Highway 30, near Valparaiso, Indiana.



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Traxcavator excavating and loading for barracks foundations at an army camp, Indianapolis, Ind.



Traxcavator preparing right-of-way for a cross-country pipe line in Illinois.



Traxcavator backfilling between walls of a percolating dam at San Jose, California.

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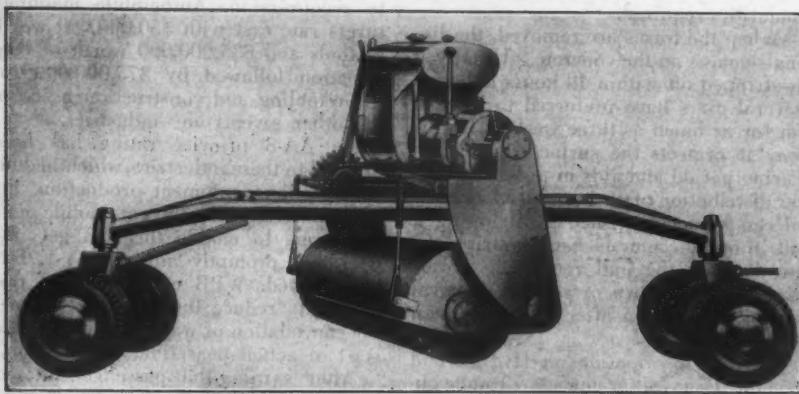
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The new Standard Steel 2-way power road broom.

### Power-Driven Broom For Many Services

A 2-way power-driven sweeper unit on which the broom is adjustable to any angle and may be operated at any speed while it is towed over a road in either direction by a truck is described in a new bulletin, Form No. S5, recently released by the Standard Steel Corp., 5001 So. Boyle Ave., Los Angeles 11, Calif. This Standard 2-way tow broom is designed for cleaning airport runways, highways, and other surfaces, and preparing bases for priming prior to the placing of bituminous tops.

The rotation of the broom can be reversed, permitting 2-way sweeping in close quarters and operation on long narrow strips of roadway where turning is difficult. There is a self-locking tongue at each end for towing. Both axles are adjustable to any angle desired to eliminate side slippage of the wheels in heavy going. The frame is a one-piece all-welded tubular unit.

A retainer spring holds the broom to the surface over uneven pavement or bases. The all-steel broom case is balanced to eliminate skipping and permits faster broom revolutions per minute as well as faster travel speed. A spring balance provides fingertip control for raising or lowering the broom and the wheelbase on which it is mounted is 14 feet to insure uniform leveling of top-coat aggregates. The 8-foot broom, which is 28 inches in diameter, is driven by a 4-cylinder air-cooled V-type gasoline engine developing 15 hp at 1,600 rpm.

Full information and a copy of Bulletin No. S5, describing and illustrating this 2-way power broom, may be secured by writing direct to the manufacturer and mentioning this news item.

### Buffalo-Springfield Is Enlarging Plant

The War Manpower Commission and War Production Board have given the green light for immediate increase in the plant personnel and installation of high-production machine tools to enable the Buffalo-Springfield Roller Co., Springfield, Ohio, to supply more rollers at the "urgent request of the U. S. Army Engineer Corps" for critical air-

port and road construction and maintenance. The company is the largest exclusive producer of rollers in the world.

Buffalo-Springfield Model KT-16 5 to 8-ton tandem rollers are standard Engineer Corps equipment and are now in use on all fronts, building military roads and airstrips. The Navy also uses these

machines widely on its far-flung shore establishments.

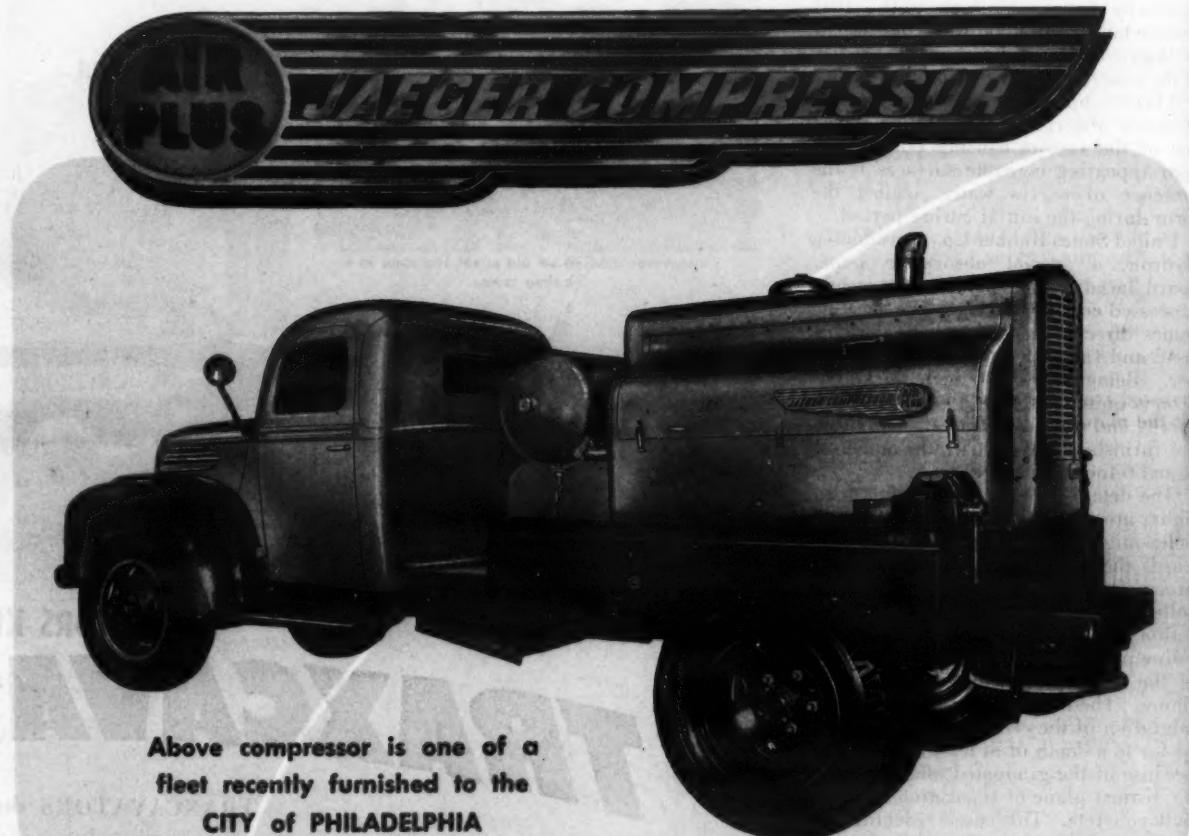
In addition to tandem, 3-wheel, and trench rollers, Buffalo-Springfield makes an exclusive 3-axle tandem machine which is being widely adopted for its ability to roll airport runways more smoothly than conventional 2-axle machines, the manufacturer reports.

The return of Major Edward E. Greiner, Executive Vice President of the company, has also been announced, after almost three years of service with the U. S. Army Air Forces.

### Construction Machinery Committee to Advise OPA

The Office of Price Administration has appointed a Construction Machinery Manufacturers' Industry Advisory Committee representing approximately 350 manufacturers of construction machinery whose ceiling prices are established by Revised Maximum Price Regulation 136—Machines, Parts and Industrial Equipment.

The members of this Advisory Committee are: H. R. Meeker, J. D. Adams Co., Indianapolis, Ind.; R. K. Stiles, Austin-Western Co., Aurora, Ill.; W. B. Greene, Barber-Greene Co., Aurora, Ill.; R. T. Harris, Blaw-Knox Co., Pittsburgh, Pa.; Paul B. Cochran, Buckeye Traction Ditcher Co., Findlay, Ohio; R. W. Newberry, Bucyrus-Erie Co., South Milwaukee, Wis.; W. J. Hazeltine, Buffalo-Springfield Roller Co., Springfield, Ohio; W. Blackie, Caterpillar Tractor Co., Peoria, Ill.; E. F. Armington, Euclid Road Machinery Co., Cleveland, Ohio; D. D. Kennedy, Foote Co., Inc., Nunda, N.Y.; George J. Dimond, Inley Mfg. Corp., Indianapolis, Ind.; Kenneth Lindsay, Iowa Mfg. Co., Cedar Rapids, Iowa; Julian R. Steelman, Koehring Co., Milwaukee, Wis.; D. M. Burgess, R. G. LeTourneau, Inc., Peoria, Ill.; Larry Glaser, Littleford Bros. Inc., Cincinnati, Ohio; W. E. Miles, Oliver-Cletrac Co., Cleveland, Ohio; F. H. Moline, Pacific Car & Foundry Co., Seattle, Wash.; H. Gusman, Wooldridge Mfg. Co., Sunnyvale, Calif.



Above compressor is one of a fleet recently furnished to the CITY OF PHILADELPHIA

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# Seabees Build Shop Of Salvaged Machines

**A Story of Yankee Grit  
And Ingenuity Under Fire;  
Floating Repair Shop Built  
To Service Dredging Outfit**

By RAYMOND P. DAY, CCM, USNR

STARTING with only a few tools, Seabees in the heavy-equipment department of a Navy Construction Battalion in the Pacific have built a floating maintenance and repair shop complete with lathes, power units, supplies, and spare parts capable of servicing floating and shore machinery on a big dredging project. This shop is as complete and well-organized as any state highway department maintenance garage. It is the equal of what most contractors use. In order to get it that way, the Seabees had to overcome unusual obstacles, met on a Pacific base, in a series of exploits which seem more like the pages of a two-gun western thriller than the usual stereotyped construction job.

These Seabees "hijacked"; they requisitioned; they borrowed and traded. They fought a mild battle with a major in the U. S. Marine Corps, and lost, even as most Seabees do who choose to tangle with the gold in their kindred service. On D-plus-10 day, while Marines were still killing little scum on the beaches, the Seabees turned loose a burst of energy. They eluded land mines, located an American-made engine lathe in a Japanese cave, dug it out, and hauled it away in triumph, using a winch truck borrowed from the same Marines whose unit the major represented. None of the land mines exploded, but today that major will still swear the only difference between "did" and "died", so far as the Seabees are concerned, is an "e" in the spelling.

## The Job Ahead

The need for a maintenance and repair shop became acute as soon as the Battalion arrived, but regular equipment for this activity was somewhere behind. Seven Northwest 80-D clamshell cranes had to be assembled on pontoon barges immediately, so they could begin to knock off the dangerous spiked coral fingers which stuck up almost to the surface of the water and menaced shipping. The Battalion was in need of small boats, too, because it is an all-floating marine outfit specializing in dredging and harbor improvement. The officers in charge saw that sunken Japanese boats could be raised and salvaged quickly if a shop were available for repair and engine installation work.

A flock of the Navy's prefabricated pontoons was assembled to make a barge 6 pontoons wide x 18 pontoons long. While some of the Seabees were doing this assembly job, others started to explore the island for tools and materials.

## Dangerous Snooping

There is something peculiar and obstinate in the average Seabee's make-up. He scorns convention. He abhors inefficiency, often called "red tape" to cover

a multitude of sins. He detests the cut-and-dried pattern of things. Even if he could have an easy lot, he would not wish it so for he is a construction man, the civilian of the services. If possible, he will borrow and swap and steal like a New England horse trader, just for the simple hell of it. That may explain why this Battalion, as soon as it toolled up its covered barge with its own supplies started out through the front lines to improve on the general situation.

Somewhere back in the hills a Marine had stumbled on a cave the Japs had used as a storage space for machine-shop equipment. Word of this discovery filtered back to the Battalion in the same mysterious way information travels between brothers who are interested in souvenir collections. Visions of sorely



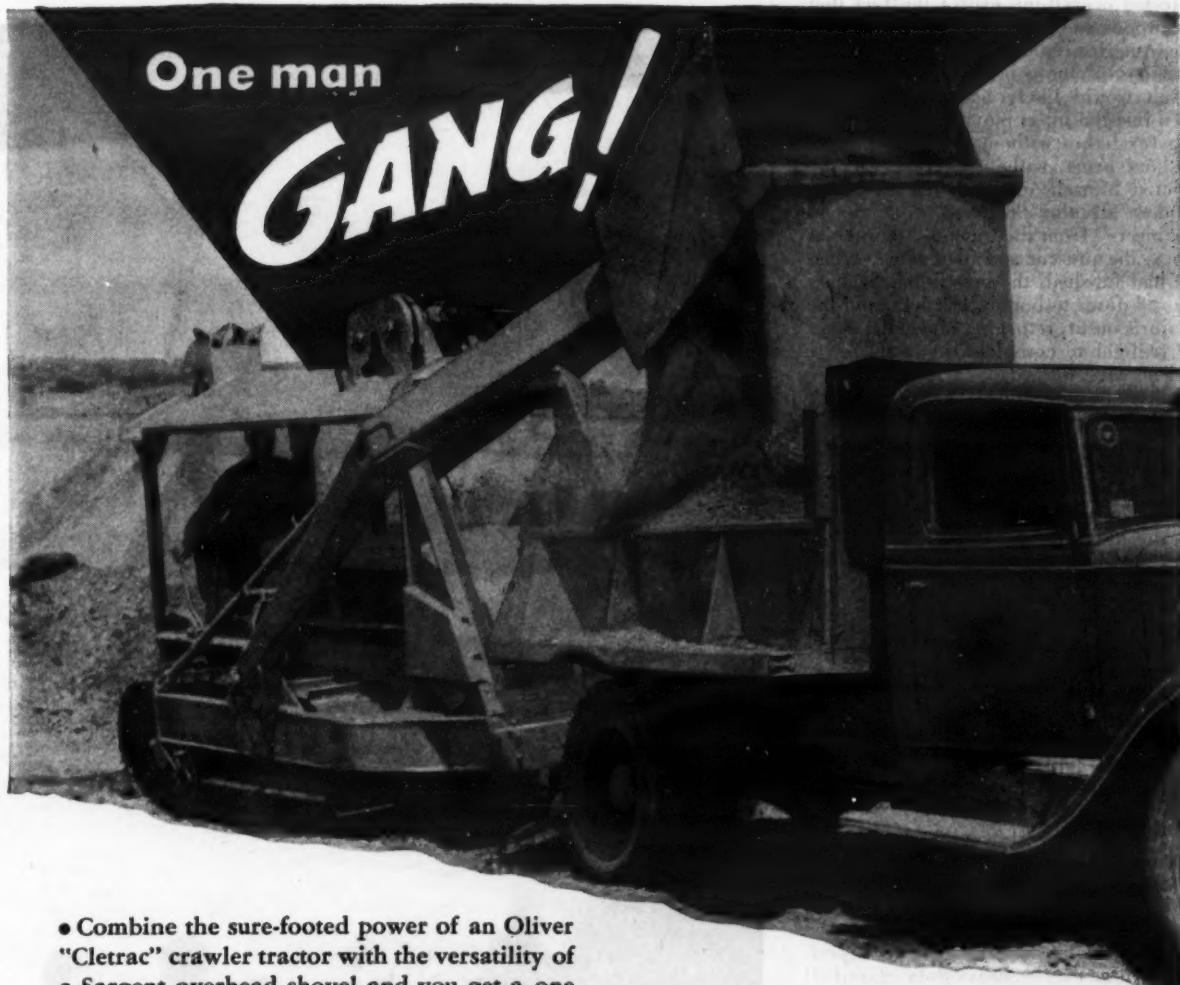
Official U. S. Navy Photo  
A view of the self-powered self-propelled maintenance barge built by a Seabee Construction Battalion.

needed lathes, drill presses, and countless tools haunted the men.

Exploration, however, was not without its dangerous possibilities. The Nips, cozy little playmates that they are, had displayed in the past a tendency to scatter land mines and nose fuzes from 500-pound bombs carelessly around their caves. There was no reason to suppose that they had changed with the times.

So the Seabees approached the cave with more caution than good sense, stepping lightly. Brushing past damp stinking walls, they made their way warily in the dim light to the rear of the hollowed-out room. Sticking out of the dirt were the drive pulleys of a post drill. In one corner the delighted Seabees found a 14-inch Hendey engine

(Continued on next page)



• Combine the sure-footed power of an Oliver "Cletrac" crawler tractor with the versatility of a Sargent overhead shovel and you get a one man construction crew that really speeds job progress.

You get maximum traction to crowd backwards into the pile and get a full dipper every time . . . to speed forward and discharge fast . . . even in the muddiest going.

This "one man gang" speeds loading out trucks . . . stripping loam or overburden . . . handling snow removal . . . digging foundations . . . tearing up and loading out old cobblestone or black top street surfaces . . . or on any job that calls for a speedy, powerful tractor

shovel. And in a very few minutes a cable operated bulldozer or angledozer can be attached for grading or spreading operations. It's an all purpose unit . . . tractor, loader, angledozer, or tractor shovel.

For complete information on the "one man gang" that can help step up the pace of your jobs, see your Oliver "Cletrac" dealer. Substantial numbers are now being released for essential use. Your dealer will gladly assist you in making application. **The OLIVER Corporation, 19300 Euclid Avenue, Cleveland, Ohio.**

**SAVE 50% ON FUEL AND WAITING TIME**  
when Heating & Melting Tar & Asphalt

USE AEROIL THE FAMOUS HEET-MASTER

55, 80, 115 and 165 gallon sizes on skids, on steel wheels or on pneumatic tires. Send for FREE Bulletin No. 2800C (specifications, prices, etc.)

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# OLIVER - Cletrac



## Seabees' Shop

(Continued from preceding page)

lathe, in fair shape, with the legend "Made in the USA" intact. This seemed more like home.

Without thinking about booby traps and the like, they began assembling rollers, tugging the lathe towards the entrance. Engrossed in the job, they dragged the lathe in the clear before they noticed a helmeted figure who held a Thompson submachine gun at "ready". On his collar lapel gleamed the gold leaf of a Marine Corps major. In his eye gleamed the tense eager look of a man who is about to commit mass homicide. "Where in the hell do you guys think you're going?" he barked.

### Stymied for a Moment

The Seabees tried to explain. They tried to bargain. They tried to persuade the major that a dredging project hung in the balance. But the major's mind rejected everything except the fact that the woods were full of Nips, that it was the American plan to liquidate certain portions of these people, and that this result would likely be reversed if the men insisted upon moving around looking for lathes without wearing helmets, without arms, without caution. He delivered himself of a lecture which included all the "earless god-damned engineers" from the time of Adam right up to the present and then some. When he had finished, the crestfallen Seabees moved down to borrow a truck from the major's outfit, returning under the cover of twilight to complete the deal.

The cave was stripped. It yielded, in addition to the engine lathe, a Delta post drill, a power saw, and some small tools. The chucks and steady rests were missing from the lathe, but a little sleuthing located these items in a souvenir collection a few miles away. Please do not ask at this point how it was done. It is a fact, and should be recorded here without digressing into a detective story.

### The Real Job

While this equipment was being set in place on the maintenance barge, along with a Caterpillar D8800 diesel-electric generating unit, the hardest job this department has done came up. Seven Northwest 80-D machines had to be assembled on pontoon barges and rigged for clamshell dredging.

The standard H-beam footing for a 5-pontoon barge had to be lengthened and shifted a bit to allow the heavy machine to center on a barge that was 6 pontoons wide. This was done at the outset, without wasting time to experiment, because the heavy-duty clamshell buckets they proposed to use seemed to point out the need of adequate footing.

With ground swells running, the cranes were unloaded by the machinery on the ship which had brought them over. It was seldom calm. As soon as the bottom section of each machine was set on the barge and leveled, the 30-ton cab section, complete with counterweights and engine, was dropped down over the side. Setting 30 tons down over a small center pin rising and falling 2 feet in the ground swells is accomplishment in anybody's language, and the fact that all seven machines were assembled without damage to a single center pin is a tribute to the skill of the men involved. As fast as the booms could be put on and rigging done, the machines were sent out to begin clearing the harbor. According to the officers in charge of this activity, all seven machines were assembled in slightly more than two weeks.

### A Real Machine Shop

A 400-ampere Hobart electric welding machine, several acetylene welding sets with gas, a 9-inch South Bend workshop lathe, a 14-inch LeBlond engine lathe, a 21-inch Excelsior drill press and two

vage and repair some of the Japanese boats which littered the harbor.

The Japanese had used a fish-tailed double-prow-model steel hull for landing craft. Seabees raised many of these hulls, patched the holes, installed Chrysler marine engines, and put them into service. In a few weeks, enough Jap craft had been rejuvenated to establish a shuttle-boat service over the harbor, thus helping other Naval units with their water transportation problem as well as the local Battalion.

Quite a few Japanese outboard motors, not ruined by immersion in salt water, were captured intact. They were complex, full of closely meshed gears, and not nearly so simple in construction as American-made outboards. But they were needed to help the surveyors get around in small boats over shallow parts of the harbor, and as the engines wore out, Seabee machinists were busy on the lathes making gears to replace the broken parts.

Tool steel, sheet stock, angle iron, and key steel were brought in, but the Sea-

bees also salvaged quite a bit of this material from the island wreckage. Many a sheave made in Japan is now doing duty in Seabee rigging. It is a sort of Lend-Lease in reverse, and one which must set ill with the oriental war lords.

### A Service Pontoon

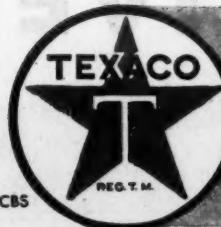
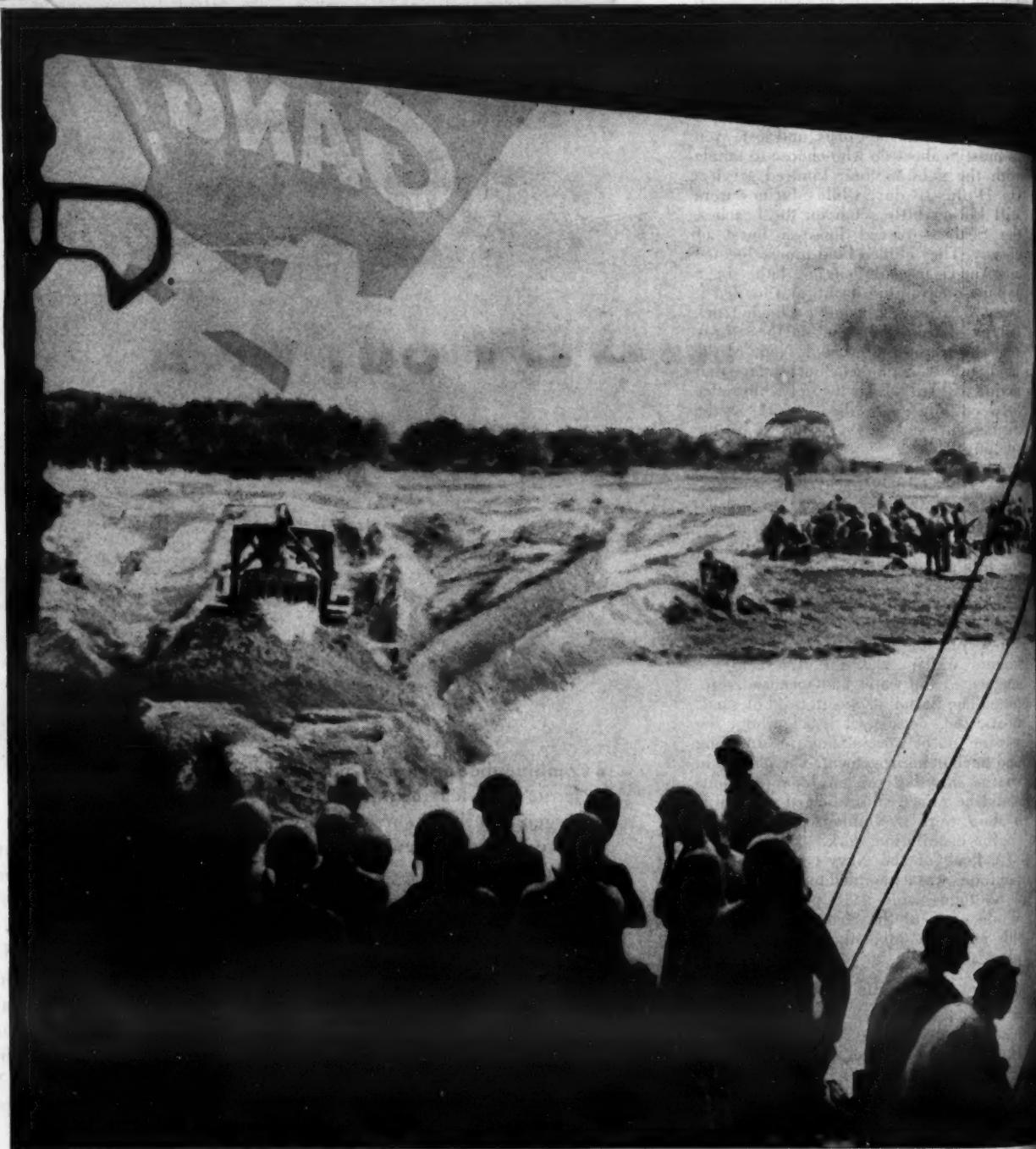
When the clamshells began digging, the Seabees built a self-propelled service pontoon to do minor servicing where the rigs were working without having to tow them in. This is a 3 x 7-pontoon barge, powered by a Murray & Tregurtha Model 02 Sea Mule outboard engine. It was outfitted with the following equipment: a Hobart electric welding machine; a Master generator of 5-kw capacity, driven by a 4-cylinder Wisconsin air-cooled engine; an Onan compressor, battery charger, and Alemite unit; a deck hoist; a 3 x 20-foot workbench with a Craftsman grinder; a Victor acetylene welding outfit; a 12-foot skiff; and wrenches, tools, spare steel stock, cable, etc. Storage space was pro-

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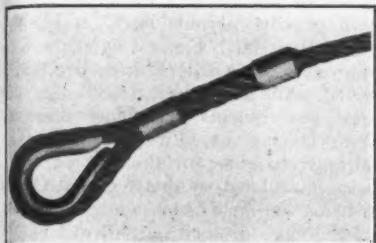
Official U. S. Navy Photo  
A Seabee welder reinforcing a Williams clamshell bucket on a portable maintenance barge. Jobs like this occupy spare time between calls.

Craftsman power grinders were added to the maintenance barge. An A-frame was built at the forward end of the barge, and blocks were rigged from a Hercules-powered 2-drum hoist to sal-



TUNE IN THE  
TEXACO STAR THEATRE  
WITH JAMES MELTON  
EVERY SUNDAY NIGHT—CBS

# TEXACO



The new wire-rope splice developed by American Chain & Cable Co.

## New Safety Splice Aids Wire-Rope Use

A new way of splicing preformed wire rope into slings or other assemblies, a method which renders hand-tuck splicing obsolete and unnecessary, has been announced by American Chain & Cable Co., Inc., Bridgeport, Conn. It is reported that this method develops a neater and more compact splice than is possible by the hand method. Further, the splice is flexible clear to the terminal and develops 100 per cent of the

rope's strength.

The ACCO-LOC safety splice does not distort the rope structure and in this way maintains equalization of stresses in all of the strands. The splice, as illustrated, applies the load stress in direct line with the pull of the load. It has no seizures to loosen, unravel, or get in the way, and there are no wire ends to tear workmen's hands.

This safety splice may be used with any standard fitting, hook, ring, shackle, thimble, etc., and when the sling or assembly is retired such fittings may be salvaged and re-used. At the present time, the new ACCO-LOC safety splice can be applied only at the factory.

### Etnyre Branch Office, Dealer Announcements

E. D. Etnyre & Co., Oregon, Ill., manufacturer of bituminous distributors and street flushers, has announced changes in its branch office arrangements and the appointment of several new distributors. To facilitate handling government con-

tracts, as well as export business and eastern sales, the company has opened an office at 1018 Vermont St., N. W., Washington, D. C., under the direction of Charles T. Hvass, Vice President. For the duration, the New England Etnyre office will be located in the headquarters of the Hedge & Mattheis Co., 285 Dorchester Ave., Boston 27, Mass., Etnyre dealer in that territory.

In the south, the Aldridge Equipment Co., 916 So. State St., Jackson, Miss., will handle sales of Etnyre distributors and street flushers, while the Michigan Tractor & Machinery Co. has opened a branch office in Traverse City, Mich., to distribute Etnyre road-building and street-cleaning equipment in that city as well as in Detroit and Grand Rapids.

Canadian dealer representatives recently appointed are: Coleman Machinery Co., Ltd., Halifax, in Nova Scotia; Geo. W. Crothers, Ltd., Leaside, Toronto, for Ontario; Laurion Equipment Co., Ltd., Montreal, to cover the Province of Quebec; and R. J. Fyfe Equipment Co., Regina, Sask., for Saskatchewan.

## Seabees' Shop

(Continued from preceding page)

vided in two of the pontoons for tools, parts and supplies.

This rig goes anywhere in the harbor on trouble-shooting calls. It gets its orders by radio. In between calls, it works on such jobs as the development of sheaves, track and weight box for a monkey line, which prevents clamshell buckets from swinging while digging at any depth up to 70 feet. The weight box travels up and down over an angle-iron track fabricated inside the crane boom.

### Spare Parts

All the spare parts needed to service almost any breakdown in Battalion machines are stored on the big maintenance barge. Sometimes, when a part is needed which is not in stock, the lathe are certainly worth all the stomach ulcers they caused. They work steadily, turning out parts not only for the Battalion, but for other outfits stuck for parts. The list of machinery part classifications on the bins sounds something like a roster of American industrial manufacturers. Here are the main ones:

Allis-Chalmers tractors  
Briggs & Stratton engines  
Case tractors  
Caterpillar engines and tractors  
Chicago-Pneumatic tools  
Chrysler marine motors  
Cleaver-Brooks water-distillation units  
Continental motors  
DeVilbiss sprays  
Heil hoists  
Hercules gas engines  
Kohler light plants  
Murphy diesel engines  
Murray & Tregurtha engines  
Northwest cranes (80-D and 25)  
Page dragline buckets  
Skagit hoists  
Sullivan air compressors  
Waukesha engines  
Williams clamshell buckets  
Willys and Ford jeeps  
Worthington compressors and drills

### Personnel

Commander F. G. Elliott (CEC), USNR, is the commanding officer of this specialized Battalion. Lieutenant Commander C. E. McKay (CEC), USNR, is its executive officer. All of its officers and most of its men were selected for their experience in marine improvement work. This example of improvising in an emergency is one illustration of how Seabee Battalions have been paying off since they were organized.

## A Trench Excavator With an Offset Boom

When excavating a ditch close to a tree, pole, or curbing, the advantage of an offset boom which will permit digging within 14 inches of a side obstruction is obvious. The Parsons Model 250 Trenchliner has this patented feature which permits moving the boom to any desired position across the full width of the chute in a few minutes. The Model 250 is mounted on crawlers 18 inches wide and 9 feet long, giving a bearing pressure of about 7 pounds per square inch. An equalizer bar connects the front end of the machine to the frames of the crawlers to insure an equal distribution of weight when traveling over uneven ground.

Five speeds on the bucket line and discharge conveyor make it possible for an operator to handle his yardage most expeditiously through the entire digging range in all types of soil. The digging speeds range from 3 to 139 inches per minute. This machine will dig trenches up to 12 feet deep and from 16 to 30 inches wide without the use of side cutters and from 24 to 42 inches wide with the side cutters and the same range of four bucket widths.

Complete information on this versatile excavator will be found in a new 8-page illustrated bulletin which will be sent promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the Parsons Co., Newton, Iowa, and mention this news item.

# GETTING THE MOST OUT OF A BULLDOZER

**C**ARVING airstrips out of jungles and dozens of equally difficult assignments have proved how expert the Seabees are in getting the most out of a bulldozer. Here, on an "easy" job, one of them builds a causeway to enable the crew of an LST to unload supplies.

On a Pacific island or here at home, getting the most out of bulldozers—and other types of construction equipment—depends not only on the operator's skill but also on effective lubrication. Maintenance-wise contractors everywhere know effective lubrication is always assured when they use Texaco.

*Texaco Ursal Oil X\*\** for Diesels and heavy-duty gasoline engines, for example, assures better compression and combustion, greater fuel economy and more power because special additives give this heavy-duty oil the valuable properties of detergency and

dispersion. Its detergency keeps piston rings free and engine parts clean. Its dispersive ability holds deposit-forming materials in suspension until drained. *Ursal Oil X\*\** resists oxidation, protects alloy bearings and prevents scuffing of rings, pistons, cylinders.

For quieter-running, longer-lasting transmission and differential gears, use Texaco transmission and differential lubricants.

Texaco lubricants have proved so effective in service they are definitely preferred in many fields, a few of which are listed below.

**Texaco Lubrication Engineering Service** is available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

### THEY PREFER TEXACO

\* More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

\* More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

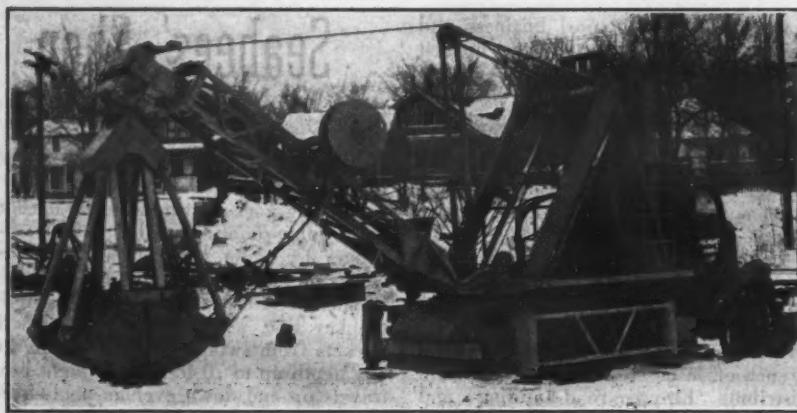
\* More revenue airline miles in the U. S. are

flown with Texaco than with any other brand.

\* More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

\* More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

**Lubricants and Fuels**  
**FOR ALL CONTRACTORS' EQUIPMENT**



The Milwaukee truck crane with hydraulically operated clamshell bucket.

### Hydraulic-Operated Truck-Mounted Crane

An entirely new type of truck crane is now offered by the Milwaukee Truck Crane Co., 30 No. LaSalle St., Chicago 2, Ill. This machine is completely hydraulic-operated with no motor, clutches, gears, drums, linings, or brakes. The power for hydraulic operation is taken direct from the truck engine at idling speed. The Model H-6 has a 6-ton lifting capacity at an 8-foot radius with a live boom which telescopes from 19 to 32 feet. Available for this machine are hydraulically operated clamshell and digging buckets, as well as a back hoe.

Hydraulically operated telescopic outriggers stabilize the operation so that there is no weight on the truck except in transporting the unit. A light pull on a control lever extends the hydraulic outrigger to 11 feet. The vertical outriggers may be independently controlled and locked in position. Only 30 seconds is required to set up the machine for operation. One man operates the entire crane from the working deck, even to driving and steering the truck, without getting into the cab.

All pumps and control valves are interchangeable and the manufacturer reports that there are less than 600 parts in the entire crane; only 15 parts are suggested as spares. The 6-ton unit is mounted on a 1½-ton truck, but the manufacturer intends to have a 2-ton-lifting-capacity unit mounted on a very small truck for industrial purposes for post-war service and has already under construction 10 and 20-ton-lifting-capacity units to be mounted on 1½-ton standard trucks with Thornton 4-wheel rear ends.

Complete information on the new Milwaukee hydraulic truck crane will be found in an illustrated folder which may be secured direct from the company by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### Welding Ideas That Mean Longer Equipment Life

The value of welding in maintenance, reclamation, and replacement of machinery and highway equipment is demonstrated in an 18-page brochure just issued. The book is profusely illustrated with photographs of equipment which has been so treated, and also contains many "how-to-do-it" photographs with detailed descriptions of the welding procedures employed to restore the equipment to active service. Another section is devoted to the construction of special

shop equipment and structures by welding from scrap metal and parts on hand. The descriptive text includes the type of welding rod used in specific operations, and the last page contains a complete list of electrode specifications.

While "101 Welding Ideas for Low-

Cost Maintenance" is not a completely new book, the material has been revised, and old and new readers will find in it useful suggestions for equipment conservation and salvage. Copies may be secured by writing direct to the Lincoln Electric Co., 12818 Coit Road, Cleveland 1, Ohio, requesting Bulletin 402.

### Some Major Changes In Surplus Disposal

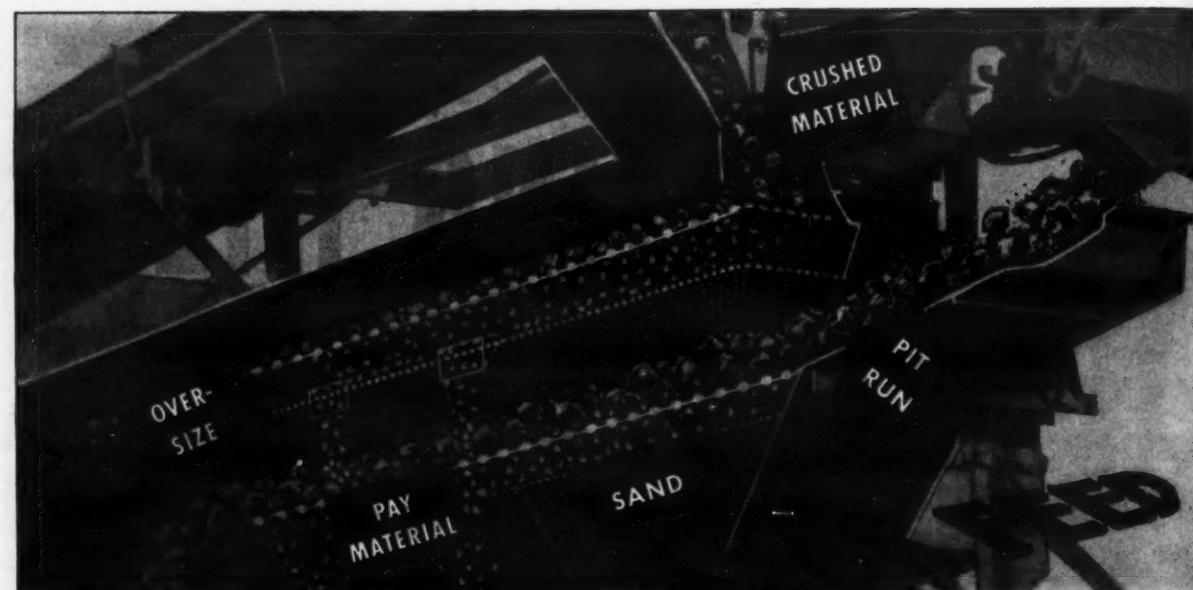
The Surplus Property Board, in Amendment No. 1 to Regulation No. 1, covering the disposal of Government-owned consumer goods, including construction and agricultural machinery, automotive vehicles, and equipment, transferred the task from the Treasury Department to the Department of Commerce as of May 1, 1945.

Under Regulation 2, effective May 25, a system of priorities was established under which Federal agencies and state, county, and local governments and their political subdivisions are being given an opportunity to purchase available sur-

pluses before other types of purchasers. Two priority periods were established. From June 1-18, Federal agencies were allowed to place orders for needed equipment; while from June 19-30 state and local governments may place their orders. During the entire June 1-30 period, merchandise on the list currently being circulated by the Regional Offices is being withheld from commercial sale. At the close of each period, orders will be filled to the extent the supply permits, first consideration being given to those carrying WPB preference ratings.

Offerings are on a "where is" and "as is" basis, priced in accordance with the appraised fair value as determined by the Regional Office.

On and after July 25, in accordance with the requirements of SPB Regulation 2, Federal agencies and state and local governments will be given written notice of available property in those categories for which they have expressed a need on Form SPB 7. This form will be distributed by the Regional Offices during the latter part of June.



EXCLUSIVE PIONEER FEATURE

**BOTTOM FEED**

Doubles effective screen area-



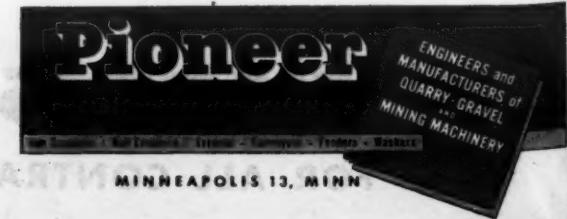
#### YOU GET THESE ADVANTAGES:

- 1 Balance the work of the two crushers without changing screens.
- 2 Produce "stone chips" in the main screen without extra screen equipment.
- 3 Control the gradation of the output to meet specifications.
- 4 Reject sand and control the percentage of sand rejected.

Duplex screening is Pioneer's radical innovation to handle the extra gradation to be done where two crushers are used in a gravel or quarry plant.

Pioneer makes one vibrator screen do the work of two. Pit material is screened on the bottom deck and the crushed material on the top deck. Both decks produce specification or pay material and "chips" can be separated. The screen shown is a 4' x 12' unit whose two decks have a combined total working area of 96 sq. ft.

Only with this exclusive Pioneer bottom deck feed can you get all these advantages. Write or talk to Pioneer Plant users, or to Pioneer engineers and distributors for further information on how to handle large crushing capacity with a single screening unit.



**C.H.&E.** CONSTRUCTION EQUIPMENT

Three Ton Telescopic Roller  
For steel work. Operates on automatic, slow forward and reverse speed, operating lever. Both front and rear rolls can be lifted and lowered on a truck for transportation from job to job.  
Write for Bulletin 30.

C. H. & E. Manufacturing Co.

## Montrose New President Of Marion Steam Shovel

At the annual directors' meeting of the Marion Steam Shovel Co., Marion, Ohio, Maynard E. Montrose was elected President and General Manager. Mr. Montrose, an executive from Los Angeles, Calif., has had a broad industrial experience. During the period of 1922 to 1935 he was connected with the General Electric Co. in various capacities, and in 1935 joined the staff of the Lane-Wells Co., Los Angeles. He was Executive Vice President until his resignation.

Other Marion appointments include

J. M. Strelitz as Chairman of the Board and General Counsel; Alec Gibson as Vice President and Treasurer; John P. Courtright, Vice President in Charge of Sales; Harvey T. Gracely, Vice President; and M. Virden, Secretary and Assistant Treasurer.

### Concreting by Pipe-Line

The Rex Pumpcrete, which transports, elevates, and places concrete in one operation, is described and illustrated in a new 24-page book just issued. The bulletin contains a complete description, supported by charts and graphs, of the

construction and operation of this piece of concrete-placing equipment, as well as job photographs, specifications, and other interesting data.

Four models of the Pumpcrete are shown: the 160 Single model with a capacity of 15 to 20 cubic yards per hour; the 160 Double, 30 to 40 cubic yards per hour; the 200 Single, 25 to 33 cubic yards per hour; and the 200 Double, 50 to 65 cubic yards per hour. Both double models are equipped with 3-way selective drive, which permits the material to pump through either or both cylinders.

Copies of this Bulletin No. 466 may be secured by writing direct to the Chain

Belt Co., 1666 W. Bruce St., Milwaukee 4, Wis., and mentioning this item.

## Mack Names Service

### Engineering Director

Harry Bernard, formerly General Service Manager, has been appointed Director of Service and Service Engineering by Mack Trucks, Inc. In his new post Mr. Bernard will be responsible for the overall policy and management control of both departments and will make his headquarters in the company's Long Island City plant. He has been with Mack since 1924.



**The HOUR-METER**—standard equipment on every "Caterpillar" Diesel Engine, Tractor and Motor Grader—is witness particularly to their stamina and long life. And the testimony it has collected over the years is something of a revelation!

The "Caterpillar" hour-meter records full "work hours." Driven direct from the crankshaft, its dial registers up to 9999 hours (which at one time users of power equipment considered a liberal serviceable life-span for a heavy-duty unit). But through their inbuilt soundness, hundreds of "Caterpillar" Diesels have multiplied in work hours the capacity of the meter.

At the right are a few of the notable hour records—as taken from latest available reports. Behind these records for long, dependable and economical performance is the outstanding "Caterpillar" dealer inspection, mechanical and replacement-parts service . . . plus "Caterpillar's" 40-year bank of track-type tractor experience, which no other manufacturer in its field commands.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

Below are a few of the hundreds of "Caterpillar" Diesels that have already registered TWO TO FIVE TIMES "9999" working hours . . . and are still going strong.

Owner*	Classification	Hours
<b>TRACTORS and MOTOR GRADERS</b>		
S. V. Christensen	Farming	59,000
Heber W. Glenn	Farming	54,000
H. M. Thompson & Co.	Oil Field	52,520
Bergner Bros.	Farming	45,000
E. C. Von Glahn	Farming	38,000
Frank Coll	Farming	36,000
R. M. Jansen	Contracting	33,950
R. M. Jansen	Contracting	32,880
Oahu Sugar Co.	Farming	32,000
Hawaiian Pineapple Co.	Farming	31,017
D. A. Kessler Constr. Co.	Contracting	31,000
<b>ENGINES</b>		
A. J. Krecker & Co.	Industrial	65,000
Denwood Oil Co.	Industrial	60,000
Rosenthal & Carter	Oil Field	46,525
Mt. Emily Lumber Co.	Logging	43,000
Fairview Lt. & Power Co.	Industrial	38,000
Copperhill Stripping & Construction Co.	Mining	33,600
Bellon Hatchery	Industrial	32,272
S. A. Murphy	Oil Field	30,240
M. DeRome	Contracting	28,000
W. E. Johnson	Industrial	26,616
Bridgport Oil Co.	Oil Field	26,320

\*Addresses on request

# CATERPILLAR DIESEL



ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

## Courage and Romance In Roeblings' Bridges

To David Barnard Steinman, prominent consulting bridge engineer and designer, American engineers owe a debt of gratitude for his 418-page book "The Builders of the Bridge," primarily the story of the trials that crossed the paths of the Roeblings in their greatest engineering feat, the Brooklyn Bridge. Preceded by the Niagara railroad bridge and the Ohio River bridge at Cincinnati, came the great Brooklyn Bridge which proved so costly in life and strength to John Roebling and his son, Washington. Delayed, but not thwarted, by the death of the father, an accident which incapacitated the son, fraud by the contractor, and financial difficulties, the great structure was slowly woven between New York and Brooklyn.

The book is written in a manner to thrill both engineer and laymen as it portrays with equal vividness the technical skill and humanity of the engineers and the rare character of Mrs. Washington

Roebling. She became skilled in higher mathematics, bridge specifications, and the intricacies of cable construction, visited the work, daily reporting progress to her husband, and also was his companion and nurse.

Dr. Steinman undertook the task of assembling the vast amount of information and the writing of this book as a "partial discharge of that debt of inspiration" which life in his early years close to the "miracle bridge" had laid upon him. He has completed his labor of love and fulfilled any obligations in the writing of this book packed with human interest and the breath of engineering romance.

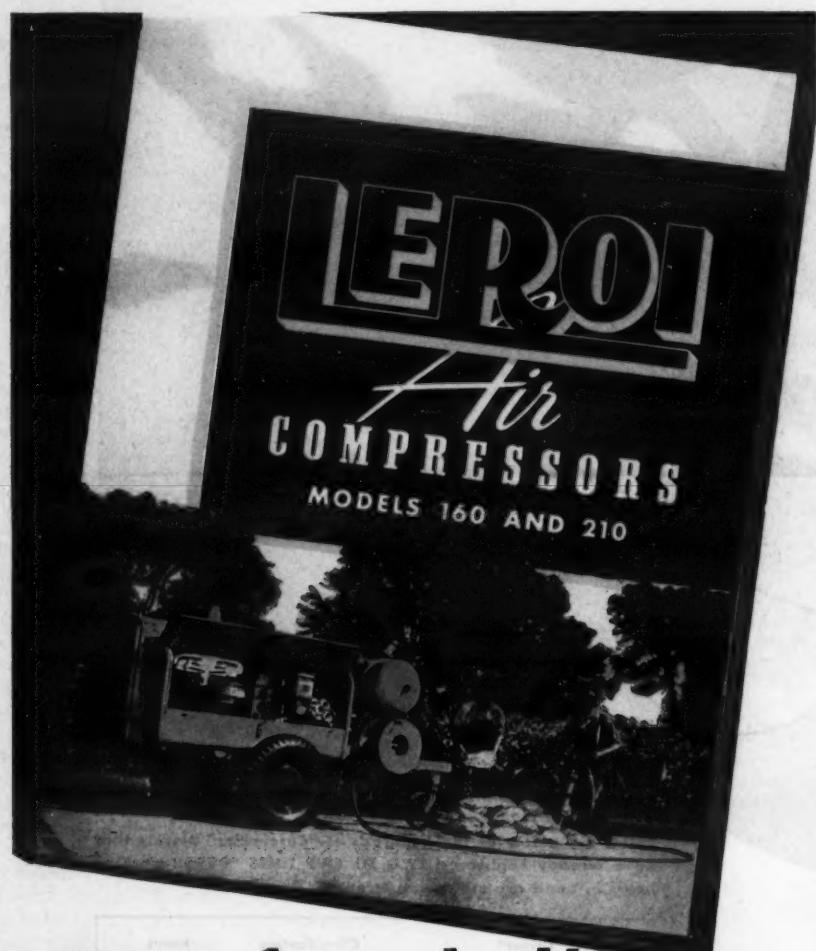
We recommend "The Builders of the Bridge" as must reading for all engineers, prospective engineers, and laymen who marvel at their creative skill. A remarkably detailed bibliography fills twenty-four pages and is followed by an eight-page index. Published by Harcourt, Brace & Co., 383 Madison Ave., New York 17, N. Y., this well illustrated book may be purchased for \$3.50.

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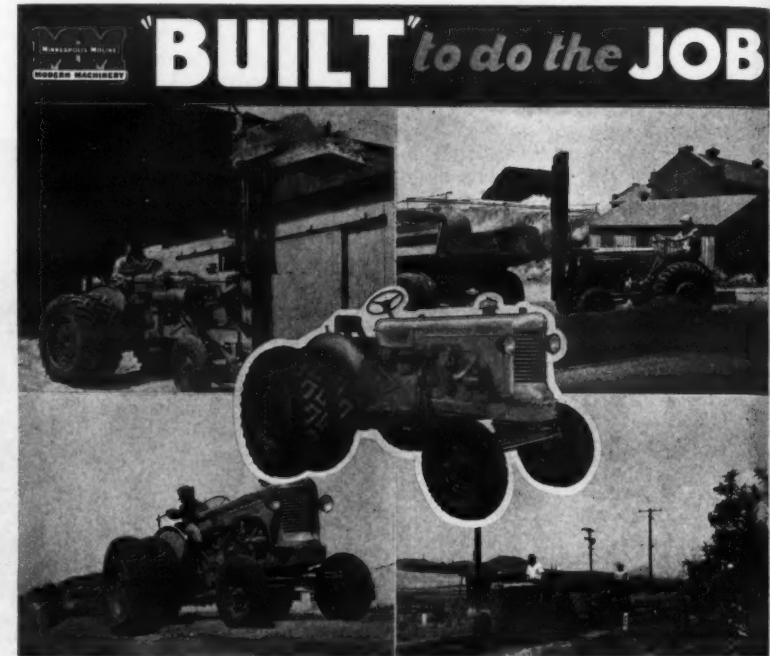


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# Maintenance Methods For Army Pavements

## Equivalent of 19,800 Miles Of 20-Foot Highway Built, Maintained, Cleared of Ice And Snow in West

By MAJOR N. H. TRUAX,\* Corps of Engineers, Chief, Maintenance and Repair Branch, Office of Ninth Service Command

The maintenance of the roads, runways, and other paved surfaces at posts within the Ninth Service Command might not be considered, at first glance, to be an operation of magnitude or complexity. However, road and paved surfaces within the posts of this Service Command, which includes the states of Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, and Utah, are equivalent to a system of approximately 19,800 miles of 20-foot highway. Only four state highway systems in the United States have mileages in excess of this figure and three of these include highways that would normally be considered as township and county roads.

The Ninth Service Command covers an area which is equal to all of the United States east of the Mississippi River except for New Hampshire and Connecticut. Extremes of temperature encountered vary from pavement temperatures of 168 degrees F at Yuma, Ariz., to minus 59 degrees F at Glasgow, Mont. Annual rainfall varies from 140 inches in Washington to less than 2 inches in Arizona, and annual snowfalls of 100 inches are common at several stations in the command. Weather varying between these extremes, dispersion of installations over the eight states, inaccessibility of many stations to adequate sources of labor, gross pavement loads in excess of 120,000 pounds, and the fact that maintenance of airfields must be accomplished in most cases under traffic, add such complications as to tax the ingenuity and resources of the military engineer.

### Maintaining Big Investment

During the fiscal year 1944, it was estimated that in this Service Command pavements initially costing approximately \$546,000,000 were being maintained. Funds expended for essential maintenance on these pavements during the same year amounted to approximately \$4,500,000, thus indicating an annual maintenance cost per square yard of approximately 2.6 cents. This extremely low figure is due in large part to the fact that a great proportion of these pavements was new and thus did not require maintenance to the degree required by the average highway pavement. It is expected, however, as time goes on and loads increase, that in many cases pavement maintenance costs will be higher per square yard than those in the care of the highway departments.

A good example of this anticipated need may be cited. At a certain airfield, the runways were designed and constructed for use by training planes with gross loadings of 17,000 pounds. Because of changes the training-mission planes now using these pavements weigh in excess of 34,000 pounds. How long these pavements will continue to withstand repeated loads of this kind, before ultimate failure, is purely conjectural. In order, however, to prolong the life of these pavements, extensive repairs and maintenance are mandatory. This procedure at this field is cheaper in the long run than reconstruction, because the field is not so geographically situated

that its use may logically be expected by civil or military aviation in the post-war period.

### Types and Problems

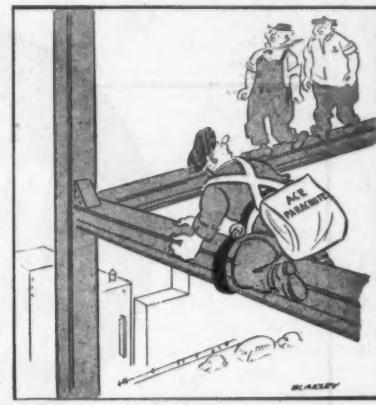
Roads and pavements on military reservations do not lend themselves to the classifications normally used by highway engineers. Classifications that can be made, according to the maintenance required to keep them in condition, are:

- Roads at hospitals, reception and separation centers, and similar installations where traffic and maintenance problems are comparable to those in a city.
- Roads at ground-force stations and in maneuver areas, subject to tank traffic and other heavy armament, which require unusual methods of treatment.
- Roads at depots and arsenals

where need for extraordinary maintenance is created by heavy loads of great frequency, oftentimes on small wheeled warehouse trucks.

d) Roads and pavements at air stations, where vibration of motors and requirements for smooth surfaces to prevent damage to planes present special problems in the maintenance of proper drainage, the sealing of cracks and joints, and the preservation of pavement strength and life.

The term "airfield pavements", as used in this discussion, includes runways, taxiways, warm-up pads, aprons, or anchorages. It might be well at this point to explain that, contrary to general opinion, impact stresses, as such, on a runway are not an important factor in either design or maintenance. This is due to the fact that when an airplane lands it ordinarily is still partially airborne, and that increased load on an airplane wheel, as a result of landing operations, results in corresponding flattening of the tire to the point where the number of square inches of the tire in



"That may be all right for you fellows, but I'd rather be safe than sorry."

contact with the pavement, multiplied by the air pressure per square inch in the tire, is equal to the load imposed. The pavements under greatest stress at an airfield are those on which an airplane warms up its engines. Because of

(Continued on page 19)

### Gulf Quality Products and Fine Service help contractors keep ahead of schedule on another big airport job!

Two views of work in progress on Wood County airport, near Parkersburg, West Virginia, where Ralph Myers Construction Company of Salem, Indiana, and Western Contracting Company of Sinton City, Iowa, are moving 27,000 yards per day to keep well ahead of schedule.

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\*Major Truax, before entering the Corps of Engineers, was associated with consulting engineers in New York and New Jersey, was County Engineer of Logan County, Ohio, and a Division Engineer of the Ohio Department of Highways.

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# Maintenance Methods For Army Pavements

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vibration stresses, these pavement thicknesses are ordinarily increased 25 per cent over designed runway thicknesses.

Since construction of most of the original roads and pavements in present use was, of necessity, done hurriedly, and in many cases during adverse weather conditions, the usual refinements of construction were often omitted. It may be anticipated, therefore, that maintenance must be started sooner and may be more extensive than would normally be expected. Careful study of the basic causes of damage and the most economical methods of correction are required in order to keep maintenance costs within reasonable limits.

Maintenance equipment is still none too plentiful for the work to be done. What we have must be kept in shape so that it can be used as long as possible before being discarded. Skill in handling, and interest in applying preventive maintenance measures to the equipment are required of all operators. We, in common with highway departments of local governmental agencies, are continually faced with the problem of finding qualified mechanics to man repair shops, and with the problem of securing necessary repair parts. Similarly, finding, hiring, and keeping qualified pavement-maintenance personnel is a continuing problem.

## Planning Maintenance

To these problems of the highway engineer is added the problem created by reduction of activity or abandonment of posts. The question to be answered in this connection is "What is the minimum amount of maintenance required?". Climate and weather, as well as length of time before final disposal of the property by the Government, have a definite bearing on the decision in each case. This is a problem that we, of the military, cannot disregard and pass over, leaving the roads and pavements uncared for, without considering what maintenance should be given them.

In general, the maintenance of roads and pavements should be continuous. This is effected by the use of the "patrol system" under which responsibility for maintenance is placed with individuals, and competition is encouraged. Secondly, maintenance should be timely. Prompt repair of small breaks, before traffic enlarges them, saves in cost of repair and minimizes wear and tear on vehicles and airplanes traveling over the pavements. If repair work is done with the proper materials for the time of year, and under favorable weather conditions, maintenance will be satisfactory, lasting, and economical. Third, maintenance should be systematic or planned. The plan should include a program of inspection of the condition of the pavements, a plan of organization for equipment, personnel, and supplies, and a plan of operation covering personnel training, care of equipment, material handling and stockpiling, and a standard routine for making repairs. These three essentials—maintenance must be continuous; main-

tenance must be timely; maintenance must be planned—must be combined and dovetailed in order to provide an efficient maintenance program.

## Concrete-Pavement Maintenance

Instructions to posts for the maintenance of concrete pavements cover cracks, expansion joints, depressed slabs, and broken and spalled sections.

Any crack in the pavement which will permit moisture to enter the pavement or subgrade should be sealed. Cracks should be thoroughly cleaned and dried before filling. The material used for filling expansion joints may be used in large cracks, while asphalt emulsion, or RC-2 or MC-3, is recommended for filling small cracks. When the walls of the crack are damp, the emulsion is preferred.

Whenever the existing bituminous material in an expansion joint is in such condition that there is a possibility that water will enter the joint, or when the joint contains non-compressible material, the joint must be cleaned. This may

be accomplished by plowing the joint, and blowing out the loose materials by compressed air. In sections where expansion-joint material is covered with concrete, remove the concrete so that a space not less than 1 inch wide is created between adjacent slabs. Priming of expansion joints before pouring is recommended for all classes of poured expansion-joint material commonly used, or tested to date. Especially is this true for the more expensive types of joint material. For the most dependable results, use a thin primer made by diluting or cutting back the material selected for sealing the joints. Mixtures of one part of filler material to three or four parts of gasoline have given very satisfactory results in field tests. Application of the primer by brooming has proved more satisfactory than application by spraying. Joints should be filled to within  $\frac{1}{8}$  to  $\frac{3}{4}$  inch of the surface of the concrete. Excess joint material lying on or extruded above the pavement surface should be removed to reduce impact stresses and provide smooth-riding surfaces.

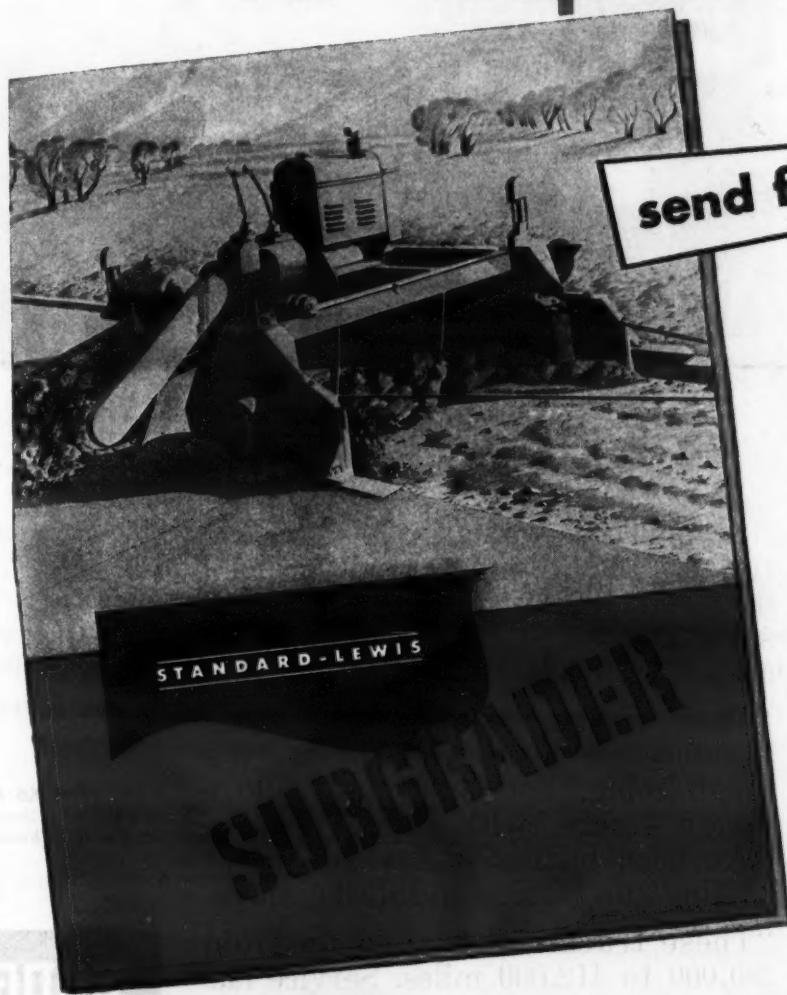
faces.

Considerable study is being given to the determination of the materials best suited for joint and crack sealing. Preliminary tests by the Chief of Engineers on two materials, not previously used for joint and crack sealing, are promising. "Filled asphalts", AASHO Specification M89-42, prepared with 60 to 70 and 85 to 100-penetration asphalt cements, with the addition of 10 to 17 per cent of calcined diatomaceous earth, have given good results from the standpoint of bond and ability to heal when cracking occurs in extremely cold weather. In the majority of cases, failure of joint-sealing compounds can be attributed to the unnecessary use of "heavier" grades of bituminous materials.

It has been observed that airfield pavements normally require lighter fillers than are necessary with road pavements. The heavier fillers may be necessary on roads to prevent objectionable flowing of material on steep grades. This is not a primary consideration on airfield pav-

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# For Complete Facts



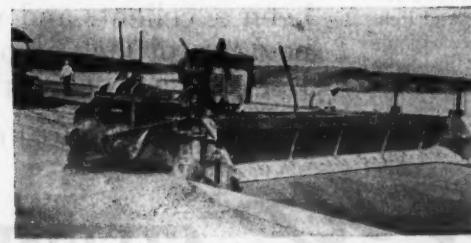
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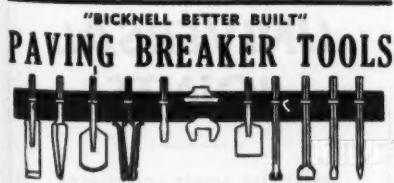
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# Maintenance Methods For Army Pavements

(Continued on next page)

ments. It has also been observed that heavier materials remain in "live" condition under intensive road traffic, but become "dead" under the relatively light traffic on runways and taxiways. The 85 to 100-penetration material is very soft at 100 degrees F., but flow is not objectionable on airfield pavements. There has been no apparent tendency for the material to pick up or track.

It is recommended that depressed slabs be raised by Mud-Jacking. Because of unusually heavy loads on floors of buildings, such as tank repair shops, it has been found necessary, on occasion, to go inside the buildings themselves, and jack up portions of the floors, and to fill voids that have developed under floors since construction. In such cases, a special Mud-Jack nozzle is used in order to reduce the size of the holes to be drilled in the concrete floors. Experience has indicated that material, of the consistency required, can be pumped through 1½-inch holes, thus reducing the danger of slab breakage through the hole section. Careful and regular attention must be given to the deflection of slab ends under load. Deflections in excess of 1/32 inch indicate the need for pumping, whether inside or outside buildings.

Cracked and broken slabs, a hazard to flying operations, and slabs over subgrades which require replacement should be removed. The thickness of the concrete used in patching these pavements should have a depth 2 inches greater than that of the original pavement. All joints are finished to match those in the original pavement. Usually, however, the broken slabs are depressed but are not loose. Where the present pavement seems fairly solid, a satisfactory method of repair is to fill the spalled areas, and cover the depressed section with a layer of dense-graded asphaltic concrete.

Particular attention is paid to low shoulders adjacent to pavements, and to areas where heavy loads travel from one type of pavement to another. Experience has shown that care in providing smooth transitions at these locations reduces impact shocks, and consequent pavement failure and vehicle damage. Where this feature has been neglected, pavement cracks, parallel to the edges and approximately 4 feet from the point of impact in the direction of traffic, have almost invariably developed.

#### Bituminous-Pavement Maintenance

Approximately 85 per cent of the airfield pavements in the Ninth Service Command are bituminous surfaces. The character of most of the base-course materials is such that the surfaces must be kept sealed. Surface cracking develops rapidly due to weathering and light traffic density. Breaks also occur in the wearing surface where traffic produces additional compaction over that originally attained during construction. In general, the cost of periodic rescaling of

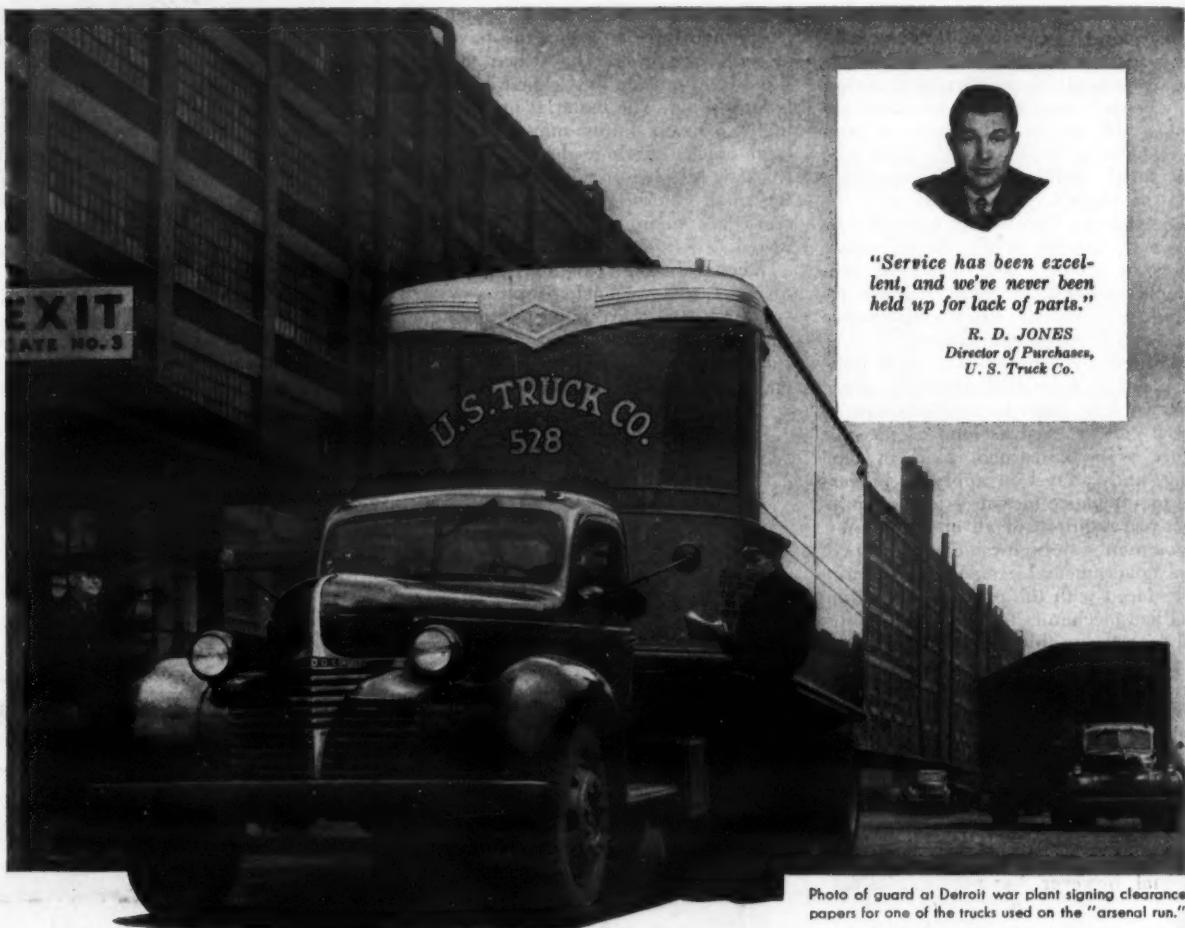
pavements is money well spent. The application of 0.2 to 0.25 gallon of MC-5 with a sand cover has proved very satisfactory in sealing airfield mats and runways that are hard and dry. Emulsions have been used as seals on pavements in which there remains considerable "life".

Experiments at certain airfields in Arizona have demonstrated the value of us-

ing a kerosene cut-back material as a seal where livening up the surface course for a reasonable depth is also required. In certain areas in one of the Service Commands in the southwest, where aggregate costs were very high, plant-mix surfaces on caliche bases have been sealed with 0.1 gallon of MC-3 per square yard, followed immediately by

rubber-tire rolling in order to "squeegee" the asphaltic material into the cracks. Rolling also assists in obtaining complete and uniform spreading of this small amount of asphalt over the entire surface. Reapplication is required over particularly porous areas. Wide cracks were individually poured. This treat-

(Continued on next page)



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**DODGE** *Job Rated* **TRUCKS**  
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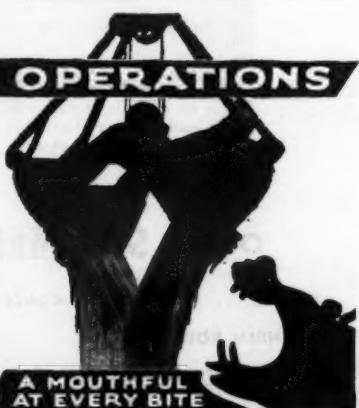
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## Maintenance Methods For Army Pavements

(Continued from preceding page)

ment effectively livened and sealed the surfaces and left a waterproof sheen. The resulting pavement was not slippery, and cured sufficiently for use in 48 hours under the temperatures, in excess of 100 degrees, which prevailed during the time of application.

Sealing without using cover aggregates was tried on an oil-mat surface in Arizona which had been constructed with MC-3 asphalt. MC-2, MC-3, MC-5, and asphalt emulsion diluted three parts emulsion to one part water were used at varying rates of application. Rubber-tire rolling was tried only with the MC-5. The weather was comparatively cool, about 60 degrees F., and the material congealed rapidly. Rolling did fill the cracks when the surface could be rolled within 30 minutes after application. The emulsion appeared to have a very limited livening effect. The MC-2 failed to provide an effective seal, due to the formation of small asphalt bubbles on the surface. MC-3 and MC-5 appeared to be satisfactory, but MC-5 was adopted because of its greater asphalt content, and because its application would permit earlier use of the field by planes. The use of the roller was not adopted, and the use of cover material was deemed essential. Application was made at the rate of 0.18 to 0.23 gallon per square yard, with 12 to 15 pounds of coarse, or concrete, sand for cover.

Some of the RC cut-backs, asphalt emulsion, and 200 to 300-penetration asphalt cement have also been used to good advantage for sealing. The use of RC material, however, has not been as successful in regions where very high pavement temperatures prevail as has MC.

Oil mats, road-mixes, and asphaltic concrete have also been used to good advantage. Our experience with these materials parallels highway-department experience.

### Care of Tank Roads

By actual measurement, some untreated traffic-bound gravel and limestone roads have shown a loss of  $\frac{1}{2}$  to 1 inch of road metal per month, due to the repeated abrasive action of steel-cleated heavy-tank treads. The dust so produced, together with the dried-out mud brought on the road by the tracks during wet weather, lay in a thick blanket over the road until it was agitated by traffic. Tank, jeep, and truck traffic stirred up this dust until visibility was so impaired that many serious accidents resulted. In addition to being a definite hazard to the health of the personnel, this dust was so abrasive on the tank engines that overhauls became a serious and costly problem from the standpoint of both expense and delay to the training program.

Concrete was tried on heavily used tank roads. Wear on these pavements due to tracking of tanks behind one another has, on occasion, caused ruts in the concrete  $2\frac{1}{2}$  inches deep. The most serious maintenance problem with concrete tank roads was progressive joint deterioration. Best results in repairing concrete tank roads were secured by the application of an RC-3 prime and a dense-graded asphaltic concrete.

Because of this high initial and maintenance expense, other types of pavement were constructed. One successful method was to clean a macadam road thoroughly and then apply  $1\frac{1}{2}$  pounds of calcium chloride per square yard. When this dried out or dusting occurred, about every five or six weeks, the roadway was again broomed, and given another application of  $\frac{1}{2}$  to  $\frac{3}{4}$  pound of calcium chloride. Patches were made by using road metal mixed with calcium chloride. This type of treatment generally re-

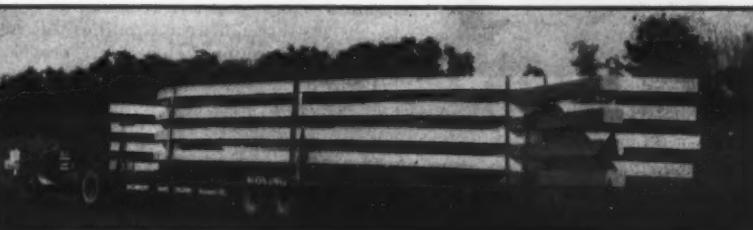
quired a total of 3 to 4 pounds of calcium chloride annually, costing 5 to 6 cents per square yard. Light sprinkling aided rapid penetration of the chemical. The crowns were kept fairly high, at least 4 inches, and mud brought on the pavement during wet weather was cleaned off as soon as practicable. Incidentally, this can be a chore if tank columns are long and the mud is sticky. For example, as much as 50 cubic yards of mud has been brought on the pavement by one movement of a tank column. The result of the calcium-chloride treatment was a firm, tight-bound, glazed surface which stood up well, even on turns. Slush developed on the surface during rainy weather, dried out more quickly than on an untreated road, and consolidated rapidly under traffic. Blades would not cut these surfaces in dry weather, and only light blading was needed in wet weather to smooth corrugations.

At one station where wet fogs and light rains are common, satisfactory tank roads were secured by the use of 5

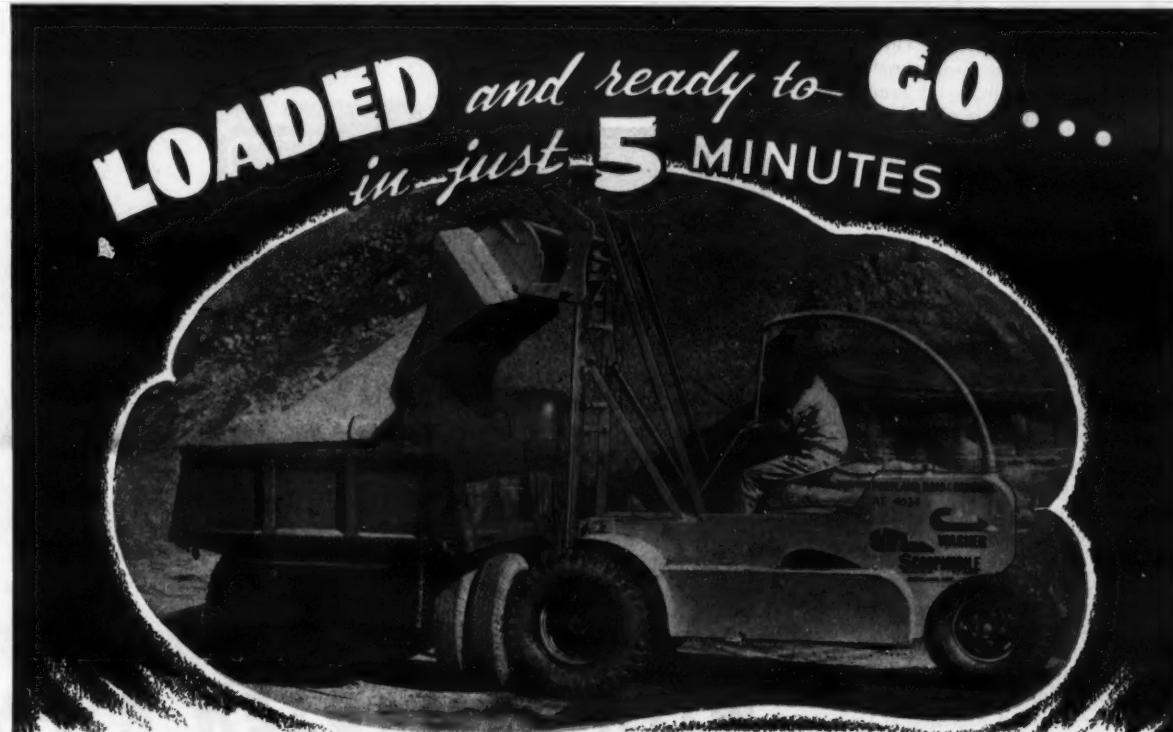
inches of compacted, crusher-run, pre-mixed limestone macadam on a 12-inch shale base. The surface aggregate consisted of approximately 30 per cent of hard limestone and 70 per cent of comparatively soft limestone. The material was uniformly graded from  $1\frac{1}{2}$ -inch top size to dust, and was wet and blade-

mixed on the road prior to rolling. The water content of the material at the conclusion of mixing operations permitted a 1-inch slump. In addition to rolling by 12-ton steel-wheel tandem rollers, advantage was taken of the rolling action of the tires on the loaded and empty

(Continued on page 53)



**HEAVY DUTY MACHINERY TRAILERS**  
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A rear view of the Marion walking dragline, showing the base raised in the first step in walking.

## Walking Draglines For High Yardage

When a contractor expects to work fairly continuously on poor ground where mats would be necessary most of the time, there is great economy in using walking draglines instead of taking the time to move mats frequently. The Marion Walker, made by the Marion Steam Shovel Co., Marion, Ohio, is designed to provide the contractor with a facility for low-cost material handling where high yardage is involved in swampy and soggy ground. These units have boom lengths from 100 to 200 feet and buckets of 5 to 12 cubic yards.

The Marion Walker principle of propelling recognizes the importance of breaking the ground suction on the base at the initial stage of the walking step to assure maximum mobility. This is done by raising the rear edge of the base and giving it a movement opposite to the direction of travel. By thus moving the base away from the edge of the depression in which it may rest when working in soft ground, the suction is quickly broken. At the point in the step where travel movement begins, the edge of the base is elevated well above the ground so that the step progresses unimpeded.

There are two self-contained walking traction units on the Marion machine, located on each side of the revolving frame. Each consists of a crank, walking arm, and walking shoe. The shoes are made of longitudinal I-beams braced by cross members welded together to form a box-type construction which is plated top and bottom. Removable cleats on the bottom of the shoes furnish traction during the walking movement.

Detailed specifications, illustrations, and diagrams showing all features of the Marion Walker will be found in Bulletin No. 383 which will be sent promptly on request to readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to the manufacturer and mentioning this illustrated review.

### New Littleford Dealers

Littleford Bros. Inc., Cincinnati, Ohio, manufacturer of highway maintenance equipment, has appointed the following distributor companies to handle its black-top equipment:

Edward R. Bacon Co., 2101 Folsom St., San Francisco 10, Calif.; Carroll Edwards & Co., Richmond & McLean Sts., Cincinnati, Ohio; Hardin & Coggins, 1717 N. Second St., Albuquerque, N. M.; Milton-Hale Machinery Co., 1024 No. Broadway, Albany, N. Y.; State Equipment Co., P. O. Box 668, Harrisburg, Pa.; Gibbs-Cook Tractor & Equipment Co., 1314 Walnut St., Des Moines 9, Iowa; Indiana Equipment Co., Inc., 327 W. Market St., Indianapolis 4, Ind.; Miller G. Williams Machinery Co., Foot of Coosa St., Montgomery, Ala.; Noble-Belisle Machinery, Inc., P. O. Box 391, White River Junction, Vt.; Wolverine Tractor & Equipment Co., 35 E. Seven Mile Road, Detroit 3, Mich.; and Tractor & Equipment Co., 201 North Central St., Sidney, Mont.

## Road Work Is Subject To Wage and Hour Law

Brushing aside previous decisions in regard to the status of road construction and maintenance under the Fair Labor Standards Act of 1938, the U. S. District Court for the Western District of Pennsylvania recently held that practically all highway work is covered by the Wage and Hour Law, since highways and streets are "instrumentalities of interstate commerce". Hence any employees engaged in the construction, reconstruction, repair, or maintenance of such facilities are entitled to the benefits of the Act.

Involved in this case were fourteen highway contracts which called for work in the maintenance, repair or construction of public highways, roads, and bridges in the state of Pennsylvania. In its opinion, the Court found that public highways, roads, and bridges located in and about large industrial areas devoted to the production of goods for commerce are instrumentalities of interstate com-

merce. Likewise, the Court said that county roads connecting Federal routes with important industrial centers are instrumentalities of commerce since they are regularly used in the transportation of persons and goods traveling between states and for pick-up and delivery of mails and freight. City streets in industrial metropolitan areas are also amenable to the law under this decision.

Under administrative rulings of the

Wage and Hour Administrator, the reconstruction, maintenance, and repair of highways serving interstate commerce were held to be subject to the law, but no ruling was made as to the status of new construction, which was generally believed not to be covered. However, this decision holds that the Act applies to new construction of interstate facilities as well as to the repair and reconstruction of existing facilities.

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"We mixed 75,920 tons from October 1 to December 8 with our 3000-lb. Madsen Plant."

"33,000 tons of asphaltic concrete was mixed by our Madsen Plant in 26 eight-hour days."

Madsen Plants offer synchronized plant operations accelerated to the faster mixing of the high speed Madsen pug mill mixer. Seconds are saved by asphalt pressure-injection—a Madsen patented exclusive feature. Additional time is saved

in the mixing operation because the asphalt is quickly incorporated in the whirling aggregates. Only 4 to 6 seconds by stop watch are required to dump the batch. These seconds saved actually produce 25 to 40 more batches per 8-hr. day.

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3. Jack-Erection System

4. Overflow Bin for Easy Stock Feeding

# Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

*These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.*

## What Part of Highway Is Employer's Premises?

In Pennsylvania, as in some other states, the workmen's compensation law makes the right of an employee to an award for injuries sometimes dependent upon the fact that the accident occurred upon the employer's premises.

In the Keystone State and other jurisdictions, the question has been debated in court to what extent, if at all, a highway upon which a contractor's men are working constitutes his premises. The general attitude of the courts is to treat that part of the road upon which work is presently being done as part of the employer's "premises" for the time being. That naturally means that his premises are constantly shifting.

That attitude was thus expressed by the Pennsylvania Supreme Court in the case of Kattera v. Burrell Const. & Supply Co., 33 Atl. 2d, 498: "It cannot be seriously contended when an employer engages in highway construction that the premises shall, therefore, take in the entire length and breadth of the route." \* \* \* The courts in cases of this kind have restricted the term 'premises' in work of this character to include only that portion of the highway on which construction is in actual progress, so that the 'premises' of the employer in such cases are transitory and temporary, changing as the work proceeds from day to day or hour to hour."

Accordingly, the Supreme Court ruled that an employee who had quit work for the day and was riding on a truck of the employer to a nearby point on the road where he had left his lunch-box and jacket, where no work was being done, was not entitled to an award for injury resulting from his falling off the truck. It was pointed out that the employer had not authorized his employee to ride trucks for such a purpose.

## Overnight Parking Of Road Equipment

Use of extreme care to safeguard nighttime drivers on roads under construction will pay dividends in the way of diminished risk of damage suits, which involve trouble and expense even when they are defeated. What care should be used to keep clear of liability is indicated in a case decided by the Maryland Court of Appeals.

That was a case where an automobile side-swiped a 30-ton ditch excavator that was parked for the night along the side of a paved road under construction. The machine encroached upon the traveled portion of the road 3 feet 8 inches, because conditions would not permit parking it farther to one side, without moving it a considerable distance from the location where it was to be used the following morning.

Suits for damages for injuries sustained by the occupants of the car were dismissed on

the ground that the driver was sufficiently warned of the presence of the machine by a string of lights along the roadside and by lights on the excavator itself.

It must have been argued by the attorneys for the plaintiff that if a large machine could not be moved completely off the roadway, smaller equipment should have been used, for the court said that the defendant "had a right to use this digger, and it cannot be ruled that modern machinery must not be substituted for old and archaic methods" which might afford greater safety to users of the highway. (Lutzer v. Washington Suburban Sanitary Commission, 28 Atl. 2d, 839.)

## Right to Collect Pay Under Illegal Contract

The courts of the different states agree that where a contract for public work is illegal the contractor cannot recover the *contract price*. But there is no uniform rule as to whether he

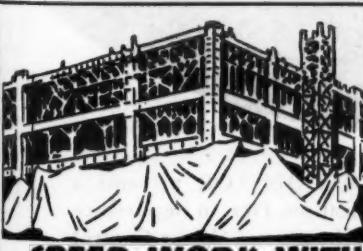
may recover the *reasonable value* of work and labor furnished, not exceeding the contract price. The general rule is, however, that reasonable value is recoverable where there is no flagrant violation of law, such as failure to call for bids. For example, in Arkansas it has been decided that failure to give a statutory bond did not prevent recovery of reasonable value of work done by the contractor. (Burt v. Road Improvement District, 159 Ark. 275, 253 S. W. 1.)

But a reading of the Connecticut Supreme Court of Errors' statement in the case of Kelley v. Torrington, 80 Conn. 378, 68 Atl. 855, should deter any contractor from entering upon work without substantial compliance with all statutory requirements. In that case a statute required that a highway contract be awarded to the lowest bidder, be in writing, and that the contractor give a bond. The lowest bidder, a partnership, started work without signing a contract presented for signature and without giving a surety company bond. The authorities notified the contractors that no payment would be made until the bond was given, and they abandoned the job. Subsequent litigation raised the question whether the contractors could collect for the work done. The Supreme Court ruled that they could not, and that it made no difference whether the town authorities knew the contractors had started work. The court said: "This would be as much an evasion of the statute as though no bids had been called for or made."

## When Is a Highway Job Repair or Improvement?

When a contractor undertakes a job for a governmental agency, he is bound to determine whether or not the agency is given power by law to have the job done. Usually that turns upon the wording of a local statute or municipal charter. Having spotted the wording, one may be in doubt as to just what it means. Take, for example, a case which arose in Indiana. It was desired to pave a graveled road. If the work constituted a "repair", the cost properly was paid by the county, under then existing statutes. If it constituted an "improvement" or "reconstruction", the cost was chargeable to the township in which the road was located. The township lost out on its contention that the job was a "repair". The Indiana Supreme Court said:

"If it were the purpose of this proceeding to restore the road to its original grades and specifications by the use of the same materials with which it was originally improved, the work so contemplated might be properly regarded as a repair; but this proceeding contemplates a re-improvement of the highway with material entirely different from that used in the original improvement. Such a road could not be properly made at the expense of the entire county under the guise of repairs." (Bettenbrock v. Miller, 185 Ind. 600, 112 N. E. 771.)



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Rollers, busy on airfield and airstrip construction and maintenance in

every quarter of the globe, have helped pave the way for their sorties.

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# HUBER ROLLERS



U. S. Army Signal Corps Photo

This new airstrip on Okinawa was graded by bulldozer and compacted by this outfit for use by U. S. aircraft supporting advance ground forces.

## Counties of Kansas Save to Buy Later

When new road-building and maintenance equipment is again available, the counties, townships, and cities of Kansas are likely to have the money on hand to purchase what they need, according to information released by the American Public Works Association. These provident government units are setting up, under statutes enacted by the State Legislature in 1941 and 1943, special reserve funds for use when the materials and man-power situation becomes easier and equipment can be bought.

Funds accumulating now amount to \$2,457,515, of which \$1,320,976 has been set aside by 83 counties, \$489,987 by 459 townships, and \$146,552 by 194 cities of all classes. Kansas government authorities believe that, at the present rate of increase, practically all the town-

ships eligible to create such funds, as well as a large percentage of counties and cities, will do so.

The procedure for setting up a special purchasing fund is this: a resolution is passed annually by the county, town, or city and a copy sent to the treasurer of the governmental unit, who then credits to the special fund the amount provided in the resolution and debits the road, bridge, or street fund from which it is taken. The sum cannot exceed 25 per cent of the amount credited to the regular fund and subject to legal expenditure in the year.

The amount transferred may vary from year to year, and the special fund can be augmented by residual monies at the end of each fiscal year. Road machinery may be purchased with all or part of the funds at any time and without notice to the public. The statute governing these special funds also pro-

vides for the re-transfer of any amount to the road, bridge, or street fund if it is not needed in the special purchasing fund, but such re-transfer and expenditure are subject to the provisions of the budget law.

## Varied Steel Forms For Concrete Projects

A new bulletin has been published by Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., giving twelve practical suggestions as to why steel forms are especially valuable in concrete work, when and where to specify them, the types of Blaw-Knox steel forms available, and numerous illustrations of jobs being built with these forms. Another feature of this bulletin is the practical design suggestions for types of structures where steel forms can be economically adapted for their construction.

Copies of Bulletin No. 2035 may be secured direct from the manufacturer by mentioning this review.

## Road Work in Venezuela

Many highway projects were discussed at the Second Venezuelan Engineering Congress held in Maracaibo January 21 to 28, 1945, and were referred to the President of Venezuela for consideration. The most ambitious was a 5-year program of road construction, principally extensions or improvements of existing national highways, to proceed at the rate of 460 miles of road a year. This project would cost 300,000,000 bolivares, to be raised by doubling the present gasoline tax. A bolivar is equal to about 30 cents in U. S. currency.

Three projects, representing a total of 310 miles in the Altamira-Coro, the Coro-Barquisimeto, and the Coro-Moron sections, were recommended. These roads would connect oil fields in the State of Falcon with Caracas, the capital city, and Maracaibo, important oil seaport. The Carora-Palmarejo cut-off, which would shorten the road distance between Maracaibo and Caracas by about 90 miles, was also discussed.

**1-Rectangular Dowel** — Has 2½ times the carrying capacity of the conventional round dowel of same cross-section area over 1" joints; 15% stiffer than the usual commercial steel; eliminates hazard of dowel embedment.

**2-Dowel Socket** — A tight and immovable socket encasing the dowel allows dowel to move when paving expands or contracts; positive assurance against dowel freezing, and resulting spalling of concrete.

**3-Dowel Flanges** — Held firmly against filler to insure proper alignment even during roughest handling in placing concrete. With installation holder removed, they are free to move with expanding or shrinking concrete.

**4-Lead-Distributing Fins** — Deformed vertical steel fins assure a perfect bond, distribute loads, cut concrete stresses to 1/3 those of conventional round dowel.

Write today for your copy of this valuable 50-page booklet of engineering information on Brandt Paving Dowels. Results of scientific test made by College of Engineering, University of Maryland, invaluable to engineers and contractors. Do it now!

When you specify Brandt Paving Dowels you are actually "Protecting the joints — insuring the paving." For Brandt Dowels assure you of load transfer capacity across the joints to suit wheel loads, and the dowel sockets scientifically distribute these loads to prevent stressing adjacent concrete. Most important of all, in construction Brandt Dowels assure accurate and positive dowel levels and alignments — quickly and simply.

The years of research, service testing, and installing behind Brandt Dowels are a guarantee of this. So don't put through another paving job — don't specify any other dowel assembly — until you get full information on how these precisely engineered Brandt Paving Dowels give you better paving jobs, at lower total cost!

Highway Products Division

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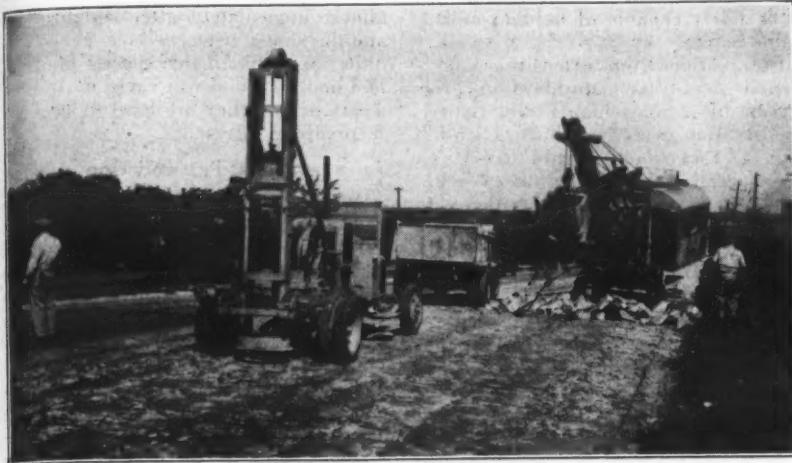
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C. &amp; E. M. Photo

A flagman controlled traffic around the pavement breaker and shovel working on repairs to the approach slabs of a grade separation near McCook, Ill.

## Approaches Repaired For Grade Separation

**New Concrete for Old in Pavement On 5 Per Cent Grade to Overpass Carrying Highway Over Railroad: Settlement Had Caused Cracking**

\* SOUTHWEST of Chicago, near McCook, Ill., the topography of the ground is flat where U. S. 66, the Joliet Road, crosses the Indiana Harbor Belt Railroad on a bridge having approach grades of 5 per cent. Over the years these approach fills had settled and slipped because of unstable subgrade conditions, causing the 40-foot concrete paving to crack and buckle. This condition was rectified in September, 1944, when the Illinois Division of Highways awarded a contract to Milburn Brothers, Inc., Mt. Prospect, Ill., to break up the existing concrete pavement, remove certain portions, and construct a new 10-inch mat-reinforced pavement for the full length of the approaches.

Traffic over the bridge and highway was maintained by constructing half the width of the roadway at a time. Of the 421-foot west approach, 241 linear feet of pavement, about equally divided between the two ends of the slope, had to be removed, while the remaining 180 feet in the central section was left in place but was broken into pieces about a foot square. On the east side of the bridge, 119 linear feet of pavement was removed beginning at the toe of the slope, then an intermediate stretch of 130 feet was broken but left in place, while the remaining 212 feet adjoining the bridge was removed. The east approach is 762 feet long, while the bridge has a span of 344 feet.

### Breaking and Paving

Little time was consumed in breaking the pavement, using a mobile unit consisting of a 1,000-pound steel weight moving in 13-foot leads, and capable of an 11-foot stroke by means of a hoist powered by a LeRoi engine, all mounted on an International truck. The stroke was limited to 6 inches when the adjacent pavement was to remain in place. When the concrete was shattered sufficiently, a P&H Model 206 3/4-yard shovel scooped up the material and delivered



Complete line of gasoline, pneumatic and electric driven concrete vibrators and grinders  
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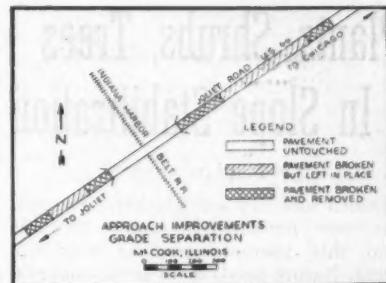
**ROETH VIBRATOR COMPANY**  
1787 Farragut Ave. Chicago, Ill.

Where the concrete was shattered but not removed, the broken area was compacted by a 10-ton roller in order to press the pieces firmly into the sub-grade. A 2-inch layer of stone screenings was spread over these sections so as to provide a smooth foundation for the new pavement. Where the 8-inch concrete was removed, a 6-inch foundation course of stone for the new pavement was spread on a 5 per cent grade and shaped by a power grader. Stone was hauled from the adjacent pit of the Consumers Material Co. A foreman and eight men were employed to break and remove the concrete, with three as truck drivers, two on the breaker unit, one shovel operator and helper, and a flagman.

The new 10-inch mat-reinforced concrete slab was poured in two 20-foot trips by a Rex 34-E dual-drum paver.

### Quantities and Personnel

The major quantities involved in this \$24,254 contract, which was finished in 45 working days, were:



Item	Quantity
Concrete pavement, new	5,256 sq. yds.
Pavement removal	2,545 sq. yds.
Pavement breaking	2,711 sq. yds.
Concrete gutter, new	2,293 lin. ft.
Gutter removal	1,127 lin. ft.
Gutter breaking	1,220 lin. ft.
Stone sub-base replacement	561 cu. yds.

This 0.2-mile grade-separation-approach paving reconstruction contract was done for the Illinois Division of Highways by Milburn Brothers, Inc., of Mt. Prospect, Ill., for whom K. Oberg was Superintendent. Wesley W. Polk is Chief Highway Engineer for the Illinois Division of Highways.

## "We call this REJUVENATION HEADQUARTERS..."



... Where Stooey Self-Hardening Puts

Worn Equipment Back on Its Feet!"

**O**PERATORS are fast learning these facts: There's more life in equipment hard-faced with Stooey Self-Hardening, there's less waste for downtime, lower maintenance costs. It's true for several reasons. Consider wear resistance for example. You can patch those worn bucket bottoms with high carbon or manganese plate but the concentrated, localized wear will soon destroy them again and you've got the job to do over.

The way to get more life from buckets, the way to reduce downtime is to put extra wear resistance on fast-wearing spots. Deposit Stooey Self-Hardening

over those patches, on teeth, lips, runners and wherever abrasion is concentrated. You'll find wear is then more nearly equalized over the entire bucket surface, fast-wearing spots are slowed down to the same rate of wear as surrounding areas, total shovel life is greatly improved. And before the Self-Hardening beads are entirely worn off, slap a few more beads over those spots. You'll keep wear at a distance that way, never letting it eat into the parent metal.

Kinks on applying Stooey Self-Hardening are given in Stooey "Specification Sheets." Write for your free copy today! Stooey Self-Hardening is sold for 50 cents per lb., f.o.b. distributor's warehouse or STOOY CO., 1136 W. Slauson Ave., Whittier, Calif.

For building up worn areas before hard-facing with Stooey Self-Hardening, specify the new Stooey Manganese. You'll get greater speed of deposit, easier slag removal, low penetration with high build-up

**STOOY HARD-FACING ALLOYS**

Retard Wear

Save Repair



# Plants, Shrubs, Trees In Slope Stabilization

(Continued from page 6)

drained and dry out quickly. The soil becomes increasingly more unstable and this prevents seedling establishment. Nature needs a bit more cooperation on the part of the engineer if local vegetation is to be able to do its share in road-bank naturalization and soil stabilization.

## Slopes Are Not Lawns

A tremendous amount of labor has been practically wasted in planting shallow-rooted annual vegetation, such as grass and annual Lespedeza, on steep banks. To try to make a slope look like a well kept lawn or a golf fairway is not good road-bank naturalization. For slopes of 1:1 or steeper, it is extremely expensive to get vegetation to give a well kept smooth appearance, and in some localities it is grotesquely out of keeping with the surroundings.

A survey of the driving public indicates that what is wanted is a natural effect of common things, like just plain briars, sumac, elderberry, and hazelnut. The public also wants to see daisies, a few sunflowers, or any of the local wildflowers in their season. Different localities have different common shrubs and flowers of the countryside, but whatever they are, that is what the public wants to see. Some roadside-development engineers have tried to extend city parks into the country, although most folks would probably rather have natural countryside effects carried out in the city parks.

Shallow-rooted vegetation, like grasses and annual Lespedeza, is not capable of holding the soil on a steep bank. Blocking out and sloughing off of the soil due to constant freezing and thawing result in those parts of the country where the ground does not remain frozen during the winter months. Hundreds of miles of banks, which at first appeared to be satisfactorily held with grass and annual Lespedeza, have failed when subjected to the strenuous effects of repeated freezing and thawing. In extremely wet seasons favoring soil slippage at the surface, shallow-rooted vegetation fails to hold the banks.

## Deeper Roots Needed

Shrubs and small trees have deeper roots and do a better job of holding an unstable bank. For slopes of 1:1 or greater, the most desirable of the planted species appear to be the deep-rooted legumes such as the perennial Lespedeza, kudzu, and Scotch broom. These, together with the local woody shrubs and vines which have relatively deep roots and do not tend to become uprooted because of their weight, offer a choice of a number of satisfactory species. Honeysuckle, kudzu, and Scotch broom are all considered to be pests in some agricultural communities. Snowberry and New Jersey tea are particularly successful where they will grow and have no undesirable features, although the former has in a few instances become a pest in pastures. In fact, almost any vigorous-growing plant may become a pest in some sections when it invades a particularly favorable locality. Thus local shrubs are more desirable than species brought in from a distance. Of the grasses, African lovegrass seems

to be fairly capable of holding an unstable bank.

Observations on extensive experimental road-bank naturalization projects by the Appalachian Forest Experiment Station in western North Carolina indicate that woody shrubs have been very successful in holding otherwise unstable banks. In every locality there are probably two or three special woody shrubs which will be the best solution in holding particularly unstable soil. The most attractive road banks are those naturalized with a mixture of local herbaceous plants associated with a higher growth of woody shrubs.

## From Plants to Forest Cover

In the eastern states, rainfall is sufficient to favor a plant succession towards a forest cover. For this reason trees may be expected to appear on engineering earth works and road banks as soon as they become stabilized by lesser weed vegetation. In the southern Appalachian mountain region, many tree seedlings appear on steep road banks

almost immediately after stabilization, and in some instances tree growth is quite rapid. Small tree species like redbud and dogwood will cause no trouble whatever and they are hard to beat for landscaping effects.

## Trees, Pro and Con

Where road banks are cut through deep residual soil profiles, or where the bank is mostly colluvial soil and angular rock fragments, the growth of large trees may be either good or bad from the engineering viewpoint. This depends upon whether the trees are likely to become uprooted. On earth dams and loose fills where trees have been growing for a longer period, instances are known where large trees became uprooted during wet periods, endangering the stability of the rest of the slope. In a few instances, earth dams have been jeopardized by the uprooting of trees. But trees do fit into the picture in the naturalization of the roadside, and where they do not become objectionable, they

(Concluded on next page)

On an Alaskan construction job, this Telsmith Dual Portable Crushing Plant is turning out top tonnage.

"We averaged 141 tons per hour  
... we crushed over 50,000 tons  
on this job... very nicely  
accomplished with this unit"



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U. S. Forest Service Photo

If given a break, local vegetation will quickly invade a steep slope and prevent erosion. Keep some organic material on a loose bank for a few months and local plants will do the rest.

## Slope Stabilization

(Continued from preceding page)

can be used to advantage. Low-growing shrubby tree species may be encouraged and the tall-growing species held back.

Where it has become established, the American hazelnut has been among the best in maintaining the stability of the soil without showing any tendency to be easily uprooted. It spreads rapidly underground from root clumps and will completely cover a bank with a dense growth. The hazelnut is not difficult to establish on a fairly fertile moist slope, but it cannot always be depended on for dry slopes. Hazelnut does fairly well on almost any fill slope. Elderberry and sumac are also good species for the fill slope, and will occasionally grow well on the cut bank. At higher elevations, native mountain laurel will come in rapidly on road banks and is capable of holding the soil against even severe frost action. Elderberry, sumac, and wild hydrangea are all good, but the latter requires a fairly moist fertile slope. In very few instances, however, are they able to form as close a cover as does the common hazelnut.

Because most roadside naturalization projects under observation have been stabilized within the past ten years, the tall-growing trees are not yet sufficiently large to produce the maximum uprooting effects, but they can be expected to cause some trouble in the future. Banks invaded by local pines have been well protected by a satisfactory upright

just how all the different local tree species will fit into roadside-development programs. It should be kept in mind that tree growth can become undesirable on slopes steeper than 1:1 by becoming uprooted during wet periods, or being blown over by the wind.

The problem of handling the larger trees must still be solved. Trees on steep banks do not grow to be as large as in the woods. Present observations in western North Carolina indicate that a possible solution is to cut back the trees close to the ground when they become about 6 feet high. This will hold back the pine and cause the hardwoods to sprout abundantly. Sprout clumps will not attain such a large size as a single stem. If cut back for the second time after another ten years, subsequent copice will have only a shrubby growth. Where trees have been cut back in the manner described, their present growth is not objectionable even after several years. The deep roots will be favorable in holding unstable banks, and subsequent tree growth will not cause trouble.

There can be no case for maintaining even low trees on inside curves where they will interfere with visibility of the road. Here only the lowest type of shrubs, such as New Jersey tea and coralberry, can be allowed. But there are plenty of these in every locality. The main thing is to plan to catch the local deeper-rooted plants on the road bank as soon as possible rather than try to discourage its growth as has been done in the past. The maintenance problem with shrubs and trees will be less trouble to solve than the constantly eroding slopes which result where there is no vegetation protection at all.

### Oliver Corp. Names Eide Industrial District Mgr.

Ivan E. L. Eide, well known in the industrial and automotive industries, has been appointed District Manager in the Pacific Northwest by the Industrial Division, Oliver Corp., Cleveland, Ohio. Mr. Eide's experience in the field covers twenty years.



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Alemite has recently developed this mobile Lubrikart for shop use.

### A One-Man Pushcart Dispenses Lubricants

A complete compact lubrication cart designed primarily for industrial plants but exceedingly handy for large garage and equipment service depots has been developed by the Alemite Division, Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill. This Lubrikart is mounted on 5-inch ball-bearing casters and is only 21 inches wide, 31 inches long, and 37½ inches high. Pushed like a perambulator, it is intended for one-man operation and is able to move between rows of machines or around equipment where space is limited.

The new Lubrikart comes in two models. The basic model carries two 7-gallon tanks equipped with a low-pressure pump with 5½ feet of hose and non-drip nozzles for filling oil reservoirs on machines or hydraulic systems, and for filling gear housings. There is also one 7-gallon tank with a high-pressure pump for loading hand guns; two 1¾-gallon tanks with oil-transfer pumps for filling oil cans; six spout-type oil cans; and four lever-type hand guns. There is also space for waste, replacement fittings, small tools, or other material.

The second model has all of the foregoing equipment and, in addition, a high-pressure hand-operated grease pump which holds 30 pounds of lubricant and has a 5½-foot lubricant hose fitted with a hydraulic coupler. This pump develops up to 7,000 pounds of pressure per square inch, and can be lifted clear of the Lubrikart and carried to the point of use, if desired. All pumps, loaders, and transfers are manually operated.

Complete information regarding the Lubrikart may be secured by writing direct to the Alemite Division, Stewart-Warner Corp., and mentioning this illustrated text.

### Bitucote Co. Acquires Eastern Production

A new manufacturing plant and shipping facilities have been acquired by Bitucote Products Co., St. Louis, Mo., at 16 Old White Horse Pike in Camden, N. J. The new plant is already manufacturing the Bitucote line of industrial asphalt products, including both clay and soap-type asphalt emulsion, asphalt paint, floor patching materials, emulsified and cut-back roof coatings and asphalt tile cements, insulation coatings, asphalt adhesives, and noise damping coatings. The Camden location provides an economical eastern distribution point for the small-package and bulk line of Bitucote Products.

L. P. Shropshire, in charge of the new plant, has become Eastern Manager for Bitucote. He was formerly associated with the Headley Emulsified Products Co. and the Asphalt Process Corp. Bitucote Products Co., whose main plant and general offices are in St. Louis, maintains manufacturing plants and offices in El Dorado, Ark., and Cincinnati, Ohio, in addition to the new Camden plant.

### New York Road Bills Become State Laws

When Governor Dewey signed the bill authorizing the construction of New York state highways in cities as part of the proposed \$800,000,000 post-war highway program, the State assumed the cost of construction of routes outlined in the 1944 law and shares equally in the cost of acquiring land necessary for the improvements.

Under the bill, cities may ask for incidental benefit construction or added improvements at their own expense and, with the consent of the New York State Department of Public Works, may undertake design and construction of the routes at their own expense. A designated route may be modified by agreement with local authorities, provided there is no excess cost to the State, and marginal or residue parcels of land may be used for roadside and landscape development.

At the same time, a bill was passed which finally gave Westchester County

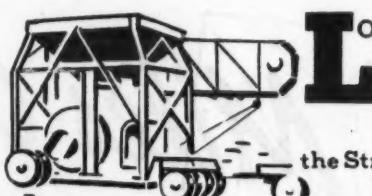
the right to collect tolls on the Hutchinson River and Saw Mill River Parkways. The new legislation becomes effective February 1, 1946, and it ends eight years of controversy over the question of tolls. As these parkways were built with Federal Aid, the money which was furnished by the Federal government must be returned. The County Board of Supervisors is authorized to fix the amount of tolls, not to exceed ten cents for each

passenger vehicle of not more than seven-passenger capacity. No commercial vehicles are allowed on these parkways.

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## Town and State-Aid Highway Needs in Vt.

### Big Volume of Construction Needed in Post-War Years to Bring State's Secondary and Town Roads Up to 15 to 20-Year Program Requirements

IN 1940, the Vermont Department of Highways completed a study and published a report analyzing the existing deficiencies in its public highway system and, taking into consideration probable future revenue as well as estimated traffic increases, proposed a 10-year construction program based on the relative urgency with which these deficiencies should be remedied.

The priority given to any deficient bridge or section of road was determined primarily by the principle that those carrying the greatest volume of traffic should be improved first. The degree of improvement also was determined largely by the volume and type of traffic. Thus traffic, or the number of highway users to be served, was the most important single factor, whether on the state, state-aid, or town system, in deciding upon what future improvements were most necessary. Work started on the 10-year program in 1941, but after Pearl Harbor all new construction in Vermont was suspended for the duration.

In the Twelfth Biennial Report, recently issued, the studies made in 1940 have been brought up to date and supplemented by new information obtained by recent surveys conducted with town officials on the state-aid and town systems, to provide Vermont with a post-war highway plan that can be put into action as soon as the war is over.

#### Town-System Needs

In order to provide every Vermont farm with an improved gravel outlet, 2,800 miles of town highways must be constructed. This work will cost an estimated \$7,500,000. On a basis of pre-war state and town appropriations, 60 per cent of the towns in the state can accomplish this work within a 10-year period, 33 per cent within a 20-year period, 6 per cent within a 30-year period, and 1 per cent within a 40-year period.

Of the 9,726 miles of town highways in the state, 3,635 miles are already of gravel. The eventual improvement of the additional 2,800 miles would make a total of 6,435 miles which would have to be maintained as gravel roads after the original construction. The remaining 3,291 miles do not directly serve any farm, being mostly land access roads used very infrequently and then only in summer.

In order to preserve a gravel road once it has been built, every town is urged to set aside part of its town highway money for gravel resurfacing. When a road is improved to gravel, it must be resurfaced periodically, and culverts and ditches given constant care, or the origi-

nal investment will be lost. According to the Report, during 1942 and 1943 about 150 miles of improved gravel town highways in Vermont had deteriorated to the point where they no longer could be classified as gravel. Maintenance is just as important as new construction if a road is to get out of the mud and stay out.

Some towns in Vermont have nearly all of their town highways surfaced with gravel. The rest, states the Report, can accomplish the same result if a proper program is followed. It is probable, however, that a few towns will need special help to get a gravel surface to every farm within a reasonable time. But the fundamental requirements for developing a system of town highways that will serve the maximum number of people all the year round are: (1) to determine exactly what roads need improvement; (2) to determine in which order they should be improved, considering present conditions, and how many farms are served; and (3) how much money can be afforded each year for new work and

maintenance.

#### State-Aid Road Needs

In order to bring the state-aid highways in Vermont up to standards which will provide adequate service to those who use them, it will be necessary to improve 1,398 miles of road and build 182 bridges. This work will cost an estimated \$9,518,820, and includes 1,389 miles of widening, sub-base and drainage costing \$6,849,210; bituminous surfacing of 332 miles of this improvement at \$761,610; 9 miles of construction on state-aid connecting links through municipalities at \$553,100; and \$1,374,900 for the 182 new bridges. On the basis of pre-war state appropriations, it will take approximately 21 years to complete this work.

The state-aid highways form Vermont's secondary road system and, next to the state highways, are the most important thoroughfares. They reach into the areas not served by the state highways, connecting the towns and smaller villages with the larger centers of popu-

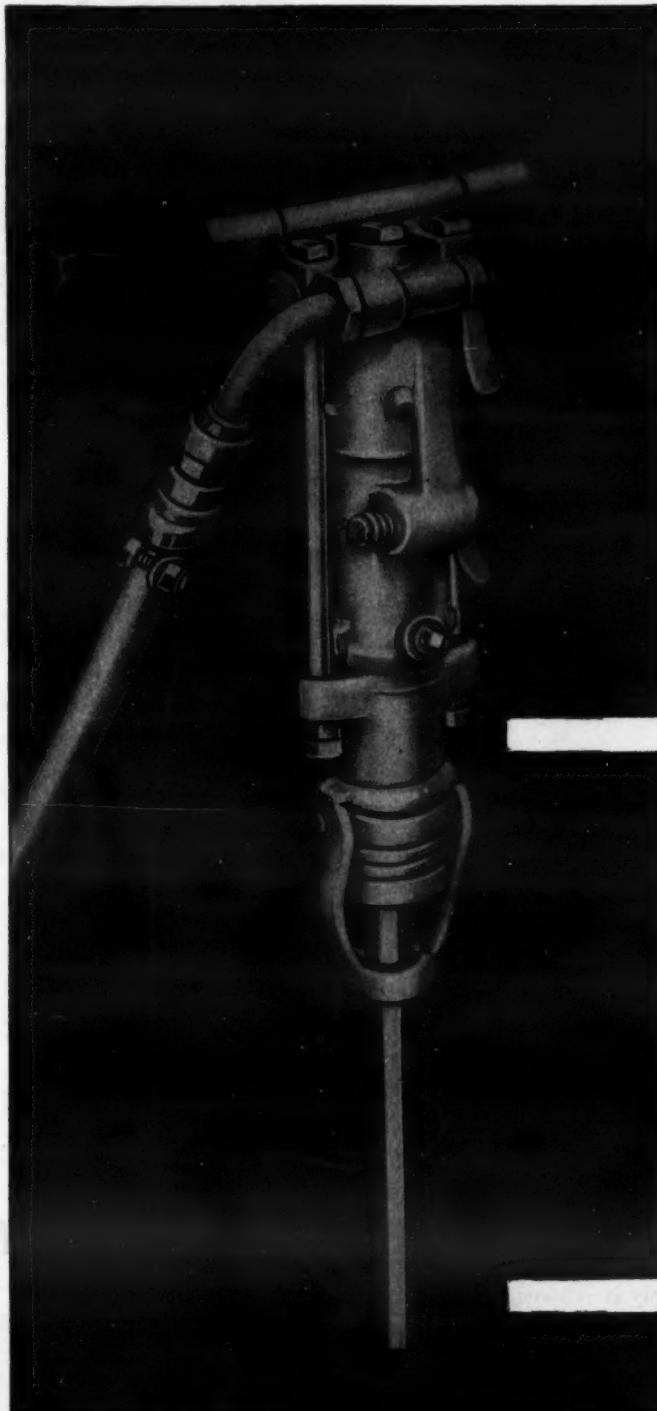


Courtesy, Wesco Reporter

"O. K., Clark Gable! We bought this light to speed up the job . . . not to promote your theatrical ambitions!"

lation. Over them are transported the milk, timber, and other produce from farms to shipping points. These routes are the main arteries for the majority of roads forming the town system. The Bi-

(Concluded on next page)



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British Combine Photo

This magnetic runway sweeper, attached to a jeep, used by the engineering staff of an R.A.F. Wellington Squadron at an airfield in southern Italy, has removed thousands of bits of metal, bomb fragments, and similar detritus items to save bomber tires.

### Town Road Needs

(Continued from preceding page)

ennial Report urges the improvement of state-aid highways as fast as available funds will permit, and their maintenance in a condition that will provide adequate service to rural areas.

#### Needed State Highway Work

In order to provide safe and adequate state highways for present and future traffic, Vermont finds it will be necessary to improve 1,044 miles of the 1,780-mile state system, reconstruct 255 bridges, eliminate 28 railroad grade crossings, and reconstruct or eliminate 20 railroad overpasses and underpasses.

This will cost approximately \$40,545,500. On the basis of estimated available revenue after the war, it will take about 19 years to complete this work.

The state system comprises Vermont's most heavily traveled thoroughfares, and as such will receive the greatest attention. However, the Department of Highways is exerting every effort to influence local government units to follow a statewide plan in improving their state-aid and town roads.

### Argentina Announces Road-Building Program

The construction of roads in Entre Ríos and Corrientes Provinces, Argentina, at an expenditure of 25,000,000 pesos, (a peso is equal to 25 cents), has been announced by the Argentine Ministry of Public Works. The roads will be built of stone and gravel, and are designed to provide access to the international bridge in process of completion across the Uruguay River at Paso de Los Libres, to connect that city with Paraná.

The first road, Route No. 126, which is now largely dirt, follows the Paraná River to Guayquiraro and crosses Corrientes Province to Paso de Los Libres. The second road, Route No. 127, follows a more direct route via Villa Federal. In addition, several small sections and connections in the two provinces will be constructed, at a cost of 1,348,487 pesos.

The Ministry of Public Works intends to intensify the construction of roads communicating with Brazil, Chile, and Bolivia, in order to comply with various agreements made in the past with those countries. Two roads to link the highway systems of Argentina and Brazil are also contemplated.



## Weight in the Right Places

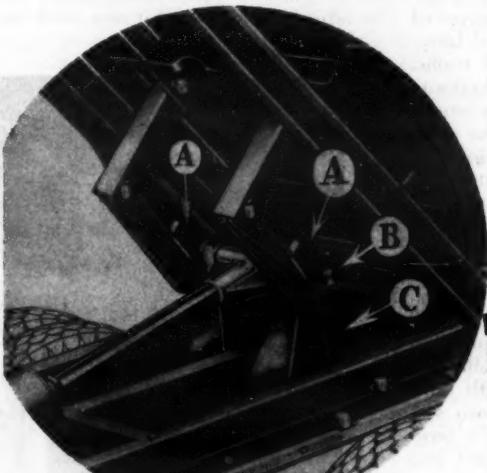
The Insley Excavator is designed with weight in the right places for fast, balanced action . . . for time saving swings . . . for one-bite digging. Every pound does double duty as stabilizing counterweight or anchor. The engine is mounted on a low turntable, well back from the center of rotation. Dead weight is eliminated from the boom . . . and from all other parts . . . assuring

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# Sand Fill Carried In Submerged Pipe

## Unique Method of Pumping Hydraulic Fill Across the Mississippi Speeds Work; No Stops for River Traffic

THE problem of how to utilize material excavated from a channel improvement on the east bank of the Mississippi River to construct a deflection dike or blanket fill along the opposite bank and maintain an unobstructed navigation channel was solved by the McWilliams Dredging Co. and the U. S. Engineers with a submerged pipe line which was laid across the bed of the river at Kempe Bend, 50 miles below Vicksburg, Miss.

At this point Old Man River, which flows nearly due west for a short distance, makes an almost right-angle turn to the south. The tendency of the current, however, is to continue in a westerly direction, with the result that the west bank of the river was gradually being cut away. If left unchecked, this tendency would result in erosion of the river bank back to the controlling line levee, necessitating a set-back of the levee, and in progressive deterioration of the channel alignment.

There were three possible solutions to the problem: a levee set-back, revetment to protect the bank, or corrective dredging to change the channel alignment and point of current attack. In this case, a levee set-back would have been a temporary expedient to be repeated time and again as the caving bank receded, with a progressive deterioration of the channel alignment. The existing alignment was not entirely satisfactory, so corrective dredging to improve the alignment was desirable before any revetment program could be undertaken. The proposed realignment made it necessary to excavate a series of cuts along the east bank of the river and transport the material across the river to be deposited in the form of a deflection dike or blanket along the west bank.

The contract for this improvement of the Mississippi River at Kempe Bend by hydraulic dredging was awarded to the McWilliams Dredging Co. of New Orleans by the New Orleans District, U. S. Engineer Department, and work was started in October, 1944. When the project is completed, a total of 7,400,000 cubic yards of material will have been pumped from about 12,000 linear feet of the east bank, transported across the 5,000-foot width of river, and deposited along approximately the same length of shore directly opposite.

### Floating Line

At the beginning of operations, a floating pipe line across the river was used. The 30-inch hydraulic cutter-head dredge Gulf Stream with 4,400 hp on the main pump was employed to make three cuts, each 250 feet wide, along the east bank. The dredged material, an abrasive and fairly heavy sand, weighing about 125 pounds to the cubic foot, was pumped from these cuts and carried across the river in a 28-inch-diameter pipe,  $\frac{3}{8}$  inch thick, on pontoons composed of two cylindrical floats 18 feet long, with "pig nose" ends to break the current, spaced 35 feet apart. These floats were held together to form the pontoon for a 50-foot length of discharge pipe, by two 12 x 12-inch timber strongbacks. The pipe connections were made by ball joints.

Because of the heavy navigation on the river, provision had to be made to break this pipe line for boats to pass. From the stern of the Gulf Stream, the discharge line was carried for about 1,000 feet out in the river on these pontoons. At this point the pipe line was

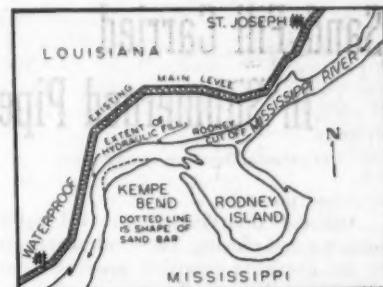
connected to a transition barge anchored in the river at the eastern end of the channel. At the downstream end of this barge was moored a pontoon, on which a swivel-joint pipe was constructed so that the pipe line crossing the channel could be pivoted, thus opening the river for navigation.

The section of pipe spanning the navigation channel was also about 1,000 feet long, and was made up of 50-foot sections of pipe flanged together in order to make the moving line fairly stiff. Another barge was anchored at the western side of the channel, and from here the rest of the river was spanned by pipe floating on a cylindrical-pontoon system similar to that used on the opposite side. The stiff pipe crossing the channel between the two anchored barges, which

was rented to the contractor for this project by the U. S. Engineers, was supported on pontoons 30 feet long x 15 feet wide x 2 feet deep, spaced 50 feet apart, and was more adaptable for moving than the bulkier cylindrical pontoons. In the center of the deck on each boat was a king pin which supported the pipe. This king pin was the hub of a circular track, 10 feet in diameter, on which the pipe also rested, and which permitted the pontoon boat to swing in any direction while still supporting the pipe.

### Opening the Span

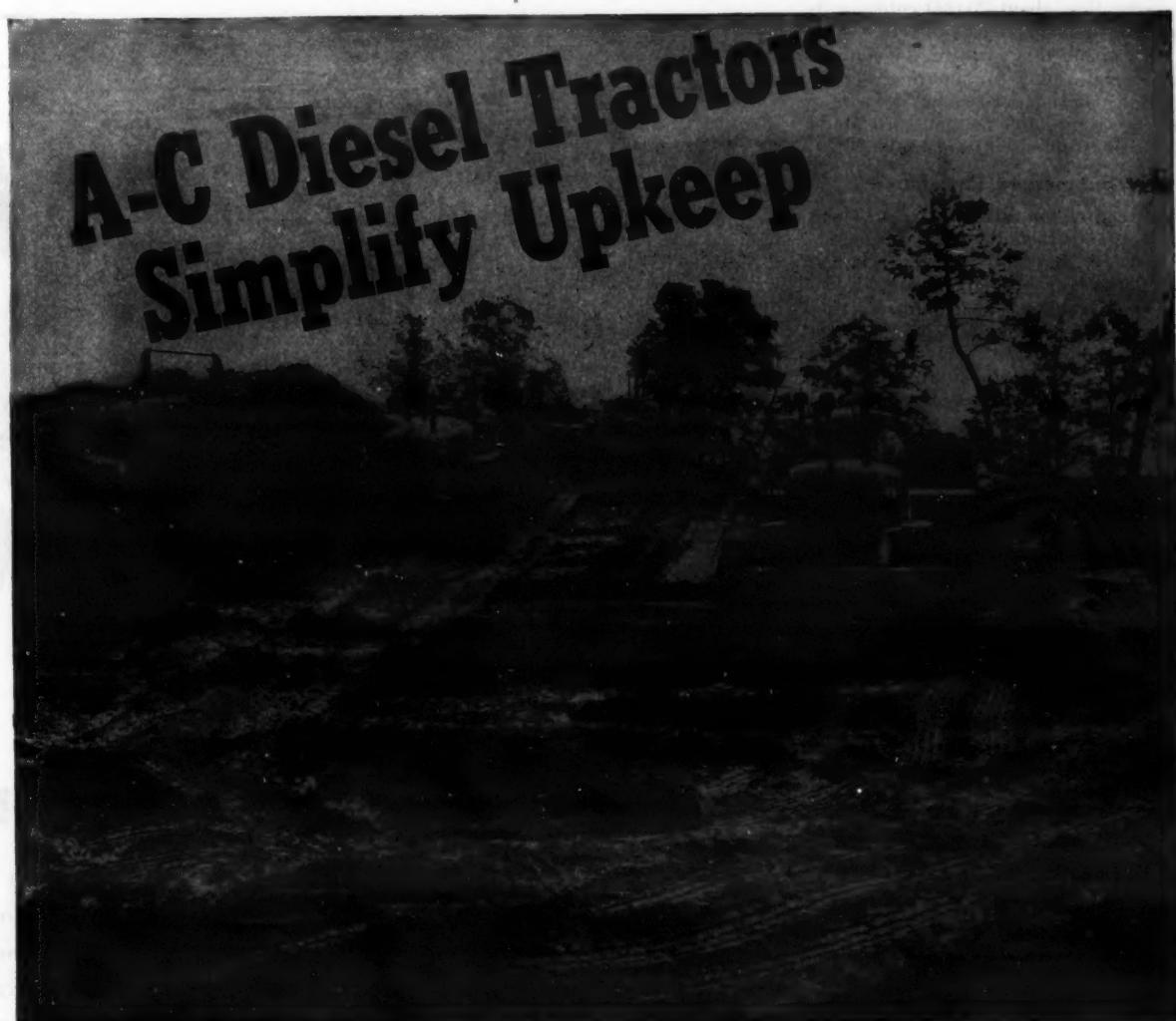
Whenever a river boat wished to pass through the line, the Gulf Stream, of course, had to stop pumping, the pipe line was then broken at the barge anchored at the western end of the navigation opening, and the released pipe line, pivoting at the eastern end, floated downstream with the current which flows at from 4 to 5 miles per hour. Closing the line after the river traffic had passed through was more difficult. A cable was



Section of the Mississippi River near Kempe Bend included in the McWilliams Dredging Co. contract.

attached to the free end of the pipe line and the other end fastened to a power winch on the barge at the western end of the opening. Two or three tugs pushed at intermediate points on the floating line, and their efforts, together with the cable and winch on the barge, brought the swinging pipe back into position with the rest of the line. The connection was then closed and the dredge

(Continued on next page)



**There is no need to keep a supply of many different grades of oil and special engine parts for each 2-cycle Diesel model. Uniform design and manufacture permit convenient interchange on all models of Allis-Chalmers Diesel tractors.**

**The same approved oil used in the 200-hour truck rollers, support rollers and front idlers may also be used in the transmission and final drives. Makes lubrication simple, fast, economical.**

**Interchange of engine parts among all models saves you additional time and money,**

• 2-Cycle •

**simplifies repairs, reduces inventory. The same sleeves, pistons, rings, connecting rods, injectors and other engine parts will fit the HD-14, HD-10, HD-7 tractors and the A-D Motor Grader.**

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**ALLIS-CHALMERS**  
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

THE MODERN DIESEL POWER

## Sand Fill Carried In Submerged Pipe

(Continued from preceding page)

resumed pumping.

Although this design provided quick opening and closing, these interruptions to the dredging retarded progress considerably. River traffic consists of some of the largest, most modern and powerful river towboats in the world and long barge tows. With each opening of the span for this traffic an average of 30 minutes was lost, and during a day this amounted to as much as 5 or 6 hours. The actual loss in dredging time was even greater. When the cutter head was forced to stop working to permit a break in the line, slides often occurred in the sandy bank being excavated, dropping tons of material to the bottom of the cut, whereupon the dredge had to be shifted about, and the ladder with the intake pipe adjusted to the new location before dredging could continue. With the floating pipe line, about 25,000 cubic yards a day was pumped across the river.

To increase this yardage, the contractor devised a plan for pumping the hydraulic material across the river in a submerged pipe line so that work would not be interrupted by river traffic.

### Submerged Pipe Line

The contractor was required to maintain an unobstructed navigation channel 15 feet deep and 800 feet wide. The use of a submerged pipe line accomplished this without the delays encountered with a floating line. As the Mississippi varies in depth at this point from 19 to 25 feet below mean low water (mean low water here is 30 feet above mean sea level), this requirement could be met by laying 760 feet of 28-inch pipe on the bed of the river across the channel and connecting this submerged line to the floating line at each end with an 80-foot length of riser pipe made from two 40-foot lengths connected with a flange joint. The 760-foot length of pipe on the bottom of the river was made up of four 150-foot sections of pipe, each of which had in turn been made up of three 50-foot lengths of spiral-welded pipe welded together flange to flange, and one section of pipe 160 feet long which was composed of two 80-foot lengths welded together by a butted spliced joint covered with an 8-inch steel band  $\frac{1}{4}$  inch thick.

At first these sections of pipe were connected by ball joints for flexibility to allow for variations in the bed of the river so that the pipe would have a uniform bearing. However, when the pipe was being unwatered leaks occurred at these joints and river water entered the submerged line. This condition was remedied by connecting the submerged sections of pipe with flange joints, which gave a satisfactory water-tight fit.

It was thought that this long rigid section of pipe should be strengthened in case portions of the line were unsupported by the bed of the river. Accordingly four H-beams were welded to each section of the pipe to be submerged. These beams weighed 19,000 pounds and displaced 2,100 pounds of water; the pipe weighed 18,000 pounds and displaced 40,000 pounds of water. After a period of testing, it was found that this reinforced pipe was much too heavy for maneuverability and the H-beams were unnecessary. They were subsequently removed from the pipe with no resulting "floating" of the submerged line.

The full length of pipe making up the submerged line was assembled along the river bank and the entire 920-foot length floated out into the river to position for submerging. The section of pipe resting on the bottom of the river at first was connected to each riser pipe with two ball joints. This riser pipe in turn was connected to the floating line also with

two ball joints. These connections were made at each side of the channel where a steel skidder barge, 70 x 35 x 6 feet, was anchored. In order to get more flexibility in the line, an extra ball joint was added at each of the four connections, and as each joint was capable of 18 degrees movement the total swing at each point was 54 degrees. This increased flexibility was a help when it was necessary to raise the pipe for any reason. The lifting was done by three 45-ton A-frame derrick barges.

### Dredge Replacement

When work on the placing of the submerged pipe line was under way, the 4,400-hp 30-inch dredge Gulf Stream was acquired by the U. S. Navy and was replaced by the 3,500-hp 28-inch hydraulic dredge G. A. McWilliams (See C. & E. M. September, 1939, pg. 16) which did all the pumping through the submerged line. The material was carried from the dredge to the barge at the edge of the channel via the floating line,

(Concluded on next page)



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**CONSTRUCTION MACHINERY**



# Sand Fill Carried In Submerged Pipe

(Continued from preceding page)

then down the riser pipe, across the bottom of the river, up the riser to the barge at the other side of the channel, then along more floating line to the shore on the west bank, where 300 to 2,000 feet of land line was placed for the final deposition of the hydraulic fill. At times, the total pipe line from dredge to discharge was as much as 6,000 feet.

With the submerged line, 45,000 cubic yards of material was pumped per day of 24 hours in comparison with the 25,000 yards pumped over the same period of time through the floating line.

## Channel Excavation

The channel excavation was divided into three adjacent cuts each 250 feet wide. Cut No. 1 nearest the bank was made to a depth of 20 feet below mean low water, while Cuts No. 2 and 3 were excavated to a depth of 30 feet below mean low water. The elevation along the inner edge of Cut No. 1 ranged up to 65 feet above mean low water. The area to be excavated was approximately 12,000 feet long, divided into eight sections, with a provision that excavation commence at the upstream end and all three cuts in a section be completed before work in the next section began.

The dredging, which averaged 90,000 cubic yards to a station, was balanced so that all sand taken from one section on the east side of the river was placed in the section directly opposite. Fill was started about  $\frac{3}{4}$  mile below Rodney cut-off where a new channel had been dug in the river in 1936 to eliminate a wide bend to the east. This cut-off is  $2\frac{1}{4}$  miles long and reduced the length of the river 5.8 miles. The placement of the fill proceeded downstream from this point so that the sand was deposited along the bank as it was discharged. The upstream 4,000 feet of the total 13,000 feet of the right bank to be improved was covered with a blanket fill built up to an elevation of 10 feet above mean low water against the bank and extending riverward 1,200 feet on a uniform slope to mean low water.

## High Water Interferes

By January 3, 1945, 2,200,000 cubic yards of fill had been placed, 35 per cent of which had been moved through the submerged line and the remainder through the floating line. At that time the water rose in the Mississippi to a height of 40 feet above mean sea level, putting a stop to the dredging operations. High water caused a swifter current which piled debris against the floating sections of pipe, producing a hazard, and also tending to wash away the sand

fill as it was deposited against the bank. The pipe consequently was removed and no further dredging work will take place until July or August when the spring floods will have abated and work can be efficiently resumed. When this project, costing an estimated \$456,580, is completed, the main levee will be at a safer distance from the nearest point of the river, and marks the first time that dredged material was ever moved across

a Mississippi navigation channel through a submerged pipe line.

## Personnel

This work is being done under the direction of the New Orleans District, U. S. Engineer Department, of which Colonel George H. Hudson, Corps of Engineers, is District Engineer. Walter Carey is Chief of the Inspection Division of the District. For the McWilliams

Dredging Co. of New Orleans, Captain L. C. Gibbs is General Superintendent, with H. H. Coleman, Master of the dredge G. A. McWilliams. Resident Engineer on the project was Charles S. White who is now completing a thesis on dredging, a field in which technical literature is fairly sparse.

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## Guns Versus Drills, A Seabee Test Stunt

This story is not new, but you may not have seen it either. It comes via *Our Navy* and is another illustration of American ingenuity in road building in far-flung places. Chief Carpenter's Mate Thomas J. Waters was finding the drilling of a hump of volcanic rock just too slow, and the road over the hump was needed quickly.

"His exasperation mounted as the delay accumulated; the compressor and its 1 1/4-inch bits were having a hard time chewing holes in which to insert the dynamite. Such a hole, 8 feet into the volcanic hill, kept a 6-man crew busy for 2 hours, and an additional 6 hours were required to enlarge the hole enough to insert the explosive."

"Looking about helplessly for some lightning bolts that could blast the entire hill out of the way, the Chief's eyes fell on an M-4 General Sherman tank lumbering past with Marine Gunner Sgt. Frederick L. Adams in the saddle.

Flagging the tank, the Chief and the leatherneck went into a huddle; the latter's Commanding Officer was visited. An agreement was reached and General Sherman pointed his long snout at the hill, squinted down the muzzle and cut loose.

"Blam! A neat hole appeared in the hill. Blam! Blam! Two more holes appeared. Waters and his Seabees made an inspection and the work continued; the compressors were kicked aside while the men settled down to watch some real road building. The experiment showed that high-explosive shells exploded when striking the face of the embankment, but that armor-piercing projectiles drilled holes approximately 10 inches in diameter and between 8 and 10 feet into the rock, which was described in the report of Lt. Commander James T. Redd, CEC, as being a 'reddish gray scoriaceous lava from volcano, containing a percentage of iron'. This hole could be quickly cleaned out and was entirely suitable for taking the dynamite charges.

"A check-up on results, Lt. Command-

er Redd said, showed a 6-man crew working with a tank could blast loose enough material in 4 1/2 hours to keep three shovels working 24 hours. Without the tank, the same crew worked 12 hours, or more than twice as long, to keep only one shovel at work for 20 hours. The cost of drilling the hole with cannon was \$59.50 for each hole, as compared with approximately \$125 for the conventional method.

"Building roads is no new job to Seabee Chief Waters; he served 10 years as superintendent of streets and sidewalks in Arlington, Mass."

### New Booklet Features

#### Road Machinery Center

An unusual undertaking by a group of manufacturers of construction equipment is the production of a 24-page booklet featuring Cedar Rapids, Iowa, as "One of the World's Leading Manufacturing Centers of Road-Building Machinery". This booklet is printed in

both English and Spanish and contains numerous illustrations of the plants of the various companies and short histories.

Twenty-five years ago, only a crusher and wagon were built in Cedar Rapids. Today in that city can be found a wide variety of construction equipment, including all types of aggregate-handling equipment, crushing and screening plants, asphalt plants, bulldozers, scrapers for road construction, land-clearing tools, spreaders, tampers, truck trailers, power-operated shovels, cranes, and draglines, and hydraulic power controls for all types of construction equipment. The companies sponsoring this publicity project are Iowa Mfg. Co.; LaPlant-Choate Mfg. Co., Inc.; Universal Engineering Corp.; Link-Belt Speeder Corp.; Iowa Engineering Co., unit of Fruehauf Trailer Co.; and Highway Equipment Co.

A copy of the booklet can be obtained by addressing any of the companies listed and referring to this review.

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# Seal Coating

(Continued from page 1)

troleum-asphalt cement, PA-2, with a 120 to 150 penetration was applied as a seal coat at the rate of 0.22 gallon to the square yard by an Etnyre 2,100-gallon pressure distributor using a 20-foot spray bar. Two such distributors were in use on this job. On Cicero and Ogden Avenues, one distributor was used for applying asphalt on the intersection returns, while on Milwaukee Avenue two distributors were used to carry the Amulco asphalt 27 miles from Chicago. In a few cases, one distributor was used as an auxiliary supply tank.

The asphalt was applied on 1,000 to 1,500 linear feet of road surface and then the distributor waited for the stone spreaders to catch up before resuming operations. In order to avoid having an excess of bituminous material at the joint where the distributor left off, a strip of paper, 2 feet wide and 20 feet long, was placed over the end of the previous application to catch the surplus from the spray bar as the distributor started a new run.

#### Pre-Treated Aggregate

The aggregate for this seal coat was  $\frac{1}{8}$ -inch pea gravel which was pre-treated with a uniform coat of petroleum-asphalt cement, PA-2, having a penetration of 120 to 150 at 77 degrees F. The stone was prepared at the asphalt plant of the Standard Paving Co. in Cicero by first heating it to not more than 375 degrees F in a drier, to drive out the moisture, after which it was mixed in a pugmill with 15 pounds, or 0.75 per cent, of PA-2 in 1-ton batches. After 30-seconds mixing, the aggregate was loaded into 12-ton trucks and hauled 18 miles to the job site. Eight trucks of various makes were used on this project in conjunction with two Buckeye 10-foot stone spreaders which laid the pea gravel at the rate of 22 pounds to the square yard.

Two 8-ton rollers, an Iroquois tandem steam and an Austin-Western tandem gas roller, went over the surface once in a longitudinal direction, beginning at the edges and working towards the center. After the first rolling and for two days thereafter, the surface was smoothed by broom drags and rolling alternately. Traffic was permitted to use the road immediately after the initial rolling.

By using pre-treated stone the dust problem was eliminated, which is a desirable feature especially in built-up sections. The thickness of this seal coat is one stone or  $\frac{1}{8}$  inch. The entire project was done in twenty-five working days around the end of September, 1944, at a total cost of \$22,639.52. The best day's run was 32,000 square yards of seal coat.

Distribution of material over the three roads in the project was as follows:

Location	Seal Coat PA-2 (gals.)	Aggregate (tons)	Area (sq. yds.)
Ogden Avenue	4,055	207	17,847
Cicero Avenue	7,159	348	29,900
Milwaukee Avenue	21,131	1,071	93,038
Total	32,345	1,626	140,785

#### Personnel

This bituminous seal coat was a project of the Illinois Division of Highways, of which Wesley W. Polk is Chief Highway Engineer. N. Geminer was Superintendent for the Standard Paving Co. of Chicago.

#### Westinghouse Transfers Lee to Arizona Office

W. E. Lee has been appointed application engineer in the Phoenix, Ariz., office of the Westinghouse Electric Corp., where he will serve the company's customers in the entire state. Mr. Lee joined Westinghouse in 1936 and in



C. & E. M. Photo

The take-off—Note the strip of paper to catch the first flush of asphalt from the spray bar on the Standard Paving Co.'s seal-coat contract on Milwaukee Avenue in Cook County, Ill.

1938 was transferred to the San Francisco office as an application engineering assistant. Later he filled various posts in the Butte, Mont., Las Vegas, Nev., and

Salt Lake City, Utah, offices; in 1943 was made an application engineer for the Industrial and Central Station Divisions in Los Angeles; and for the past

year has held a similar post for the Marine Division in that city.

#### Arthur Tuttle Elected To Haller Chairmanship

Arthur S. Tuttle, prominent New York consulting engineer, past president and honorary member of the American Society of Civil Engineers, has been elected to the office of Chairman of the Board of Directors of the Tuttle-Haller Companies which include The Haller Engineering Associates, Inc., the New England Inspection Bureau, Inc., and The Haller Testing Laboratories, Inc. The laboratory and inspection services of these organizations are available to engineers, architects, and contractors. The principal offices are located at 38 Memorial Drive, Cambridge, Mass., 801 Second Ave., New York City, and 336 Leland Ave., Plainfield, N.J.

The other officers of the associated companies are Roger L. Haller, President, Elliot A. Haller, Vice President, and Donald T. Steele, Treasurer.



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### Convenient Ladder To Service Boilers

Boilers for generating steam at asphalt plants or for driving other types of equipment require regular servicing. A southwestern contractor has devised a light steel service ladder which has many advantages over the usual wood type. The frame of this ladder, made up of extra-heavy pipe welded to form a wedge, with the working platform at the base of the wedge, weighs less than a wooden unit with an equal safety factor, and will conduct heat away from a bare boiler rapidly enough to make the rail safe for bare hands.

The pipe rounds, welded between the risers, add stiffness to the structure, and do not become slippery in wet weather. The platform at the top, supported between two facing angle irons which form the sides of the welded unit, is held in place by ears on the ends of the angles, or the oak boards may be bolted through holes drilled or burned through the lower flanges of the angles.

Two disks are welded to the bases of the pipe supports, parallel to the platform, to provide a firm footing in sand or muddy terrain.

### Kentucky Organizes To Protect Road Funds

The Kentucky Good Roads Federation, composed of representatives of forty-four highway users' organizations, has been formed to support legislation protecting Kentucky highway funds. Len B. Shouse, Lexington, President of the Blue Grass Automobile Club, was elected President of the Federation, with Lewis F. Allen, Bowling Green, President of the Kentucky Farm Bureau Federation, as Vice President.

The primary purpose of the Federation is to secure ratification of the Good Roads Constitutional Amendment at the next general election in Kentucky in November. This amendment, which would require that all funds representing highway-user taxes, such as gasoline taxes and license fees, be spent only for highway purposes, was approved for submission to the voters by the 1944 session of the General Assembly with only one dissenting vote. Sixteen states already have protected their highway funds by adopting such amendments.

### Kauffmann Made Director Of Gardner-Denver Co.

Alfred Kauffmann, retired President of the Link-Belt Co., has been elected a Director of the Gardner-Denver Co., Quincy, Ill., to succeed P. H. Gardner, who has resigned because of ill health.

Mr. Kauffmann joined the Link-Belt organization in 1901, as a draftsman, and progressed through various positions to become President in 1924. He retired in 1943, but retained his directorship in the company. He is also a member of the Board of the LaPlant-Cheate Mfg. Co., Cedar Rapids, Iowa, and of the Cardox Co. of Chicago.

### New Wood Boring Bit Speeds Woodworking

Designed on an entirely new principle, an expansive bit made specifically for use in hand braces to cut holes in wood has been announced by Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif. Applicable to state and county shops making and maintaining wood highway signs and sign posts, as well as to the preparation of forms for concrete, the Bruno expansive bit has a sturdy and unusual construction. The center lip which cuts away the core at the center of the hole extends back to form a clamp which firmly holds the adjustable blade at the diameter set. The clamp is locked tight by means of a screw. Once locked in the positive wedge-lock V groove, the cutter remains securely in place and cannot get out of adjustment.

An improved diamond-shaped screw point gives longer life by lessening the chance of breakage. The threads of the lead screw differ on the two models to correspond to the capacity of each tool.

Thus, regardless of the diameter of the hole being cut, whether through thin material or thick, true holes are cut with a minimum of effort, the manufacturer states.

Bruno expansive bits are available in two models, each of which is equipped with two cutting blades, long and short, to cover the range of the tool. The No. 200-B cuts holes from  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches and is 7 inches long, while No. 201-B

cuts all diameters from  $1\frac{1}{2}$  to  $3\frac{1}{2}$  inches and is  $8\frac{1}{2}$  inches long. Both are equipped with a standard square-bit stock shank. The blades are forged of high-grade carbon tool steel and are easily sharpened in the conventional manner, or replaced when necessary.

Further details on this handy wood-boring tool may be secured direct from the manufacturer by referring to this item.

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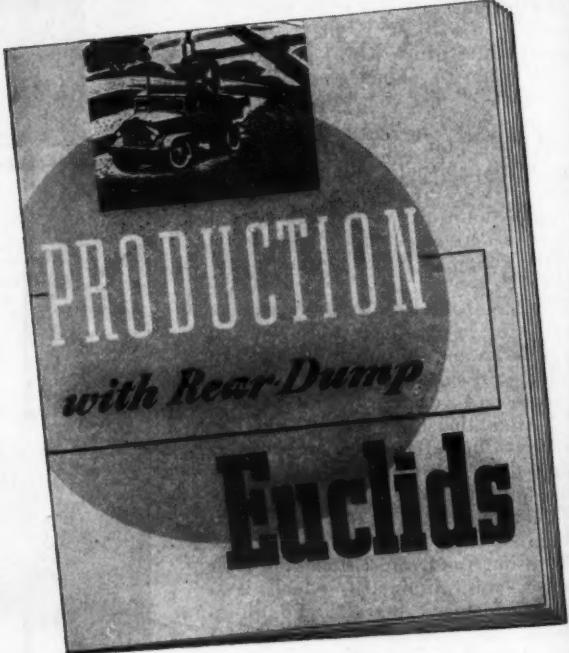
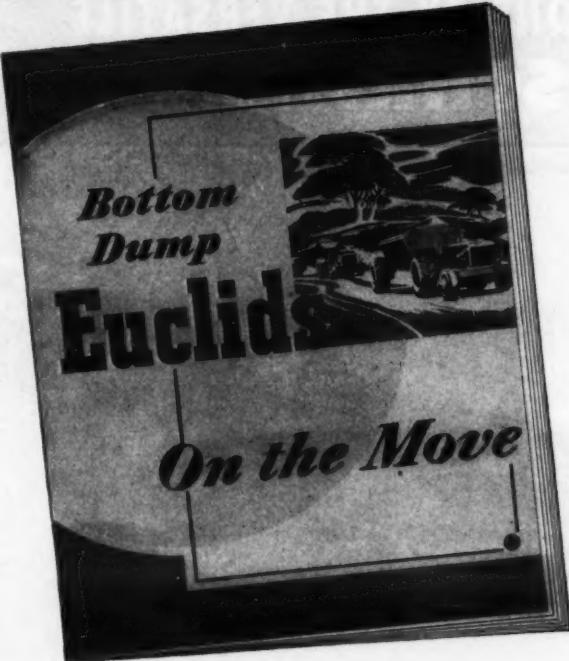
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# Big State Garage For Local Patrols

**Michigan Has State-Owned Shop at Brighton to Store And Service State Equipment Used in Livingston County**

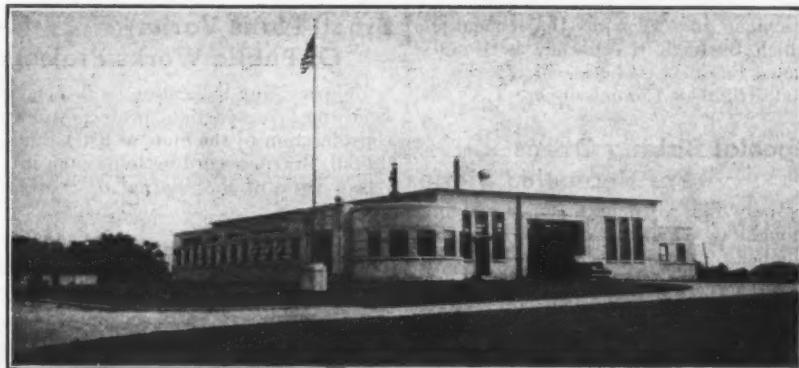
THE Michigan State Highway Department has a modern, well equipped maintenance garage located just east of Brighton on U. S. 16 about midway between Detroit and Lansing. Here are the headquarters for the crews which maintain state highways in Livingston County in the summer, keep them free of snow in the winter, and where highway equipment is serviced and repaired. Livingston County is one of the twenty-four of Michigan's eighty-three counties where maintenance work is performed directly by state crews; consequently the Brighton county maintenance garage is maintained and operated entirely by state forces.

The building is located 100 feet back from the south side of the main highway on a plot of ground with a 395-foot frontage and a depth of 528 feet. The building itself has a 236-foot frontage and a depth of 111 feet and is surrounded by grassy lawns which are traversed by two 20-foot concrete service roads connecting the east and west ends of the garage with the main highway. To the rear or south of the building is a large storage yard where construction material and snow plows are kept.

The garage has 10-inch reinforced-concrete walls, a concrete floor, and a 3-inch precast concrete roof slab reinforced with wire mesh and supported on five steel trusses which afford a 13-foot clearance from the floor to the bottom chord of the truss. The garage is entered at either the east or west end through a 15-foot-wide x 13-foot-high overhead mechanical-lift door and has natural illumination from long windows at both ends and from smaller windows placed high along the north and south walls. Artificial light is furnished by twelve 200-watt overhead bulbs in this central garage area which is 121 feet 8 inches wide x 61 feet 8 inches deep. Two turbine ventilators are located in the roof and three drains are equally spaced across the floor. The building is protected against fire by Lux Model 15 extinguishers.

#### Garage Equipment

In the southeast corner of the garage are a 3-foot 6-inch x 3-foot Buffalo blacksmith's forge, an anvil, and a Prest-O-Weld acetylene welding outfit. Also in this corner is a 3-foot-wide mechanics' work bench made of wood with a sheet-metal top, equipped with a 10-inch Black & Decker ball-bearing bench grinder, a bench vise, and a Black & Decker No. 60 bench drill. In the floor at the south end of the building is a Weaver twin-post hydraulic-lift hoist where the trucks are greased. A G-E Tungar battery charger which can charge six batteries at a time is kept here. The remainder of this room is given over to the storage of the eleven



C. & E. M. Photo

This modernistic garage of the State Highway Department at Brighton, Mich., set 100 feet back from the road and surrounded by lawns, is an asset to the community.

trucks which are used in road maintenance, including four 7-ton trucks, two Federals, a GMC, and a Duplex, and six 1½-ton GMC's and a 1½-ton Dodge. The gasoline pump and oil tanks are located near the west door.

On the south side of the garage is a wing 29 feet wide, one section of which,

28½ feet long, contains the coal storage and the heating apparatus for the garage. An automatic stoker feeds the coal to the heater whence the hot air is blown by a Clarge fan driven by a G-E 3-hp motor through a 12-inch duct to four overhead blowers in the garage. Also housed here is a Worthington compres-

sor which supplies the garage with compressed air. In the other section of this wing, which is 63 feet long, are stored skid chains, oil barrels, salt and calcium-chloride bags, and large miscellaneous equipment. This room has seven windows and is also lighted by six 200-watt bulbs. Four metal sliding doors, 7 feet 9 inches wide, two leading from the garage and two opening on the storage yard in the rear, permit the quick handling of material.

#### North Wing

On the north side of the garage proper is another wing, 19 feet 4 inches wide, at the west end of which is the administration office, 20 feet 8 inches long and rounded off into a semi-circle having a 9-foot 8-inch radius, with six windows on the arc. East of the office is a room 11 feet long which houses the heating plant for the office and locker room. Hot water is supplied by a 300-gallon tank heated by a small coal stove. This room also contains a 500-gallon

(Concluded on next page)

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## Big State Garage For Local Patrols

(Continued from preceding page)

tank for water which is pumped from a deep well in the rear of the building and brought to the garage by a 1½-inch pipe. Next in this wing is a 21-foot lavatory and locker room, with locker facilities for the fifteen men employed at the garage.

The remaining 53 feet of this wing is given over to a stock room where tools and parts are stored on wooden shelves around the sides. An 18-inch motor-driven grindstone is kept here. This room is well lighted by eight windows in front, two on the side, and four 150-watt overhead lights. Entrance is made from the garage only, through two metal sliding doors, 3 feet 9 inches and 7 feet 9 inches wide.

### Personnel

Louis Jolls is Superintendent of the Brighton maintenance garage of the

Michigan State Highway Department, of which Burleigh R. Downey is Maintenance Engineer. Charles M. Ziegler is State Highway Commissioner.

### Special Baking Ovens For Enameling Signs

Many highway departments are giving thought to the installation of a greater number of improved route number, direction, and warning signs on their existing highways as well as on post-war relocations. Replacement of temporary wood signs with sheet-metal signs enameled in the highway shops and baked in gas or electric ovens has already proved an economy in several highway departments.

Catalog No. 114 on Gehrich ovens is a guide to the selection of the right type of oven for baking, drying, or curing paint, enamel, or lacquer on metal and may be secured by writing direct to W. S. Rockwell Co., 50 Church St., New York 7, N.Y., and referring to CONTRACTORS AND ENGINEERS MONTHLY.

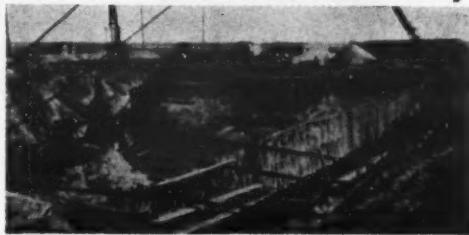
### Brazil Plans Variety Of Public Works Projects

Industry and education will benefit from the construction projects under consideration by the State of Rio Grande do Sul, Brazil, according to an item in a recent issue of the *Journal of Interna-*

*tional Economy*. This program includes five large dams, two coal-burning electric power plants, and several primary and high schools at various locations throughout the state. Local press notices indicate that the Brazilian Government may contribute extensively to several of these projects.

## Some Griffin Wellpoint Jobs

### GRiffin SYSTEM COST ZERO



The engineers invested in tons of steel sheeting for the construction of this power plant foundation, expecting plenty of water trouble, but GRiffin Wellpoints in the fine silty sand so successfully stabilized it, the sheeting was actually unnecessary.

When a new addition to the plant was started, a GRiffin System was again on the job—and no sheeting was purchased, as all banks could be sloped. The saving of this one item was greater than cost of the well-point installation.



**PROFITABLE PILE DRIVING**  
Pile-driving equipment working on a dry bank 15-feet below original water level. No mats to be shifted—just time—thanks to the Griffin Wellpoint System.



**KEEPING A HILL OUT OF A HOLE**  
Open pumping undermined the spring-filled hill at the right, a mass movement into the partly excavated site had started. The installation of a GUARANTEED Griffin Wellpoint System saved the day.



**HOW THEY LICKED CLOGGING**  
A silty stratum clogged "mesh-covered" wellpoints used by contractor "A" on the screen house structure. Contractor "B" on the power plant called in Griffin Wellpoints with "INTERFLOW" screens, and had perfect conditions throughout the job.



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Intake and Discharge tunnels in quicksand are a slow and costly problem. A Griffin Wellpoint System converted a bad ground condition into a dry, stable bottom in a FEW HOURS.

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**improve appearance  
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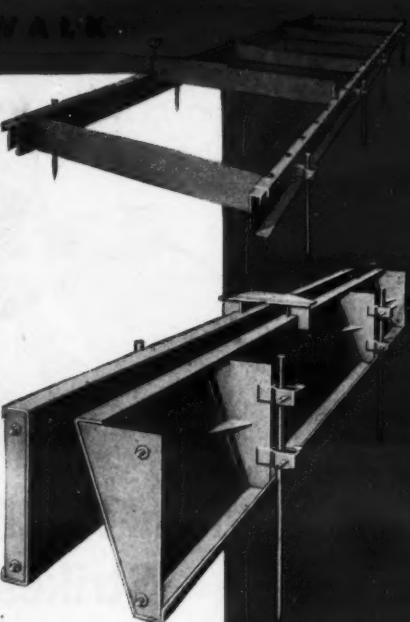
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# Timber Structures, Special Connectors

**Load-Transfer Devices for Highway Bridges of Wood Have Saved Time, Labor, and Critical Materials for War**

CONTRIBUTING to the usefulness of lumber for highway structures are the devices used to increase the allowable loads transferred from one member to another, called timber connectors. Their use in timber structures has simplified the procedures of design, and lumber has developed into an engineering material. Requiring less hardware and lumber, lower first costs as well as lower maintenance costs result. Alden K. Smith, Manager, San Francisco Office, Timber Engineering Co., in speaking before the Sixth Annual Highway Engineering Conference at the University of Utah, Salt Lake City, in March, 1945, pointed out that the total amount of hardware required through the use of timber connectors may be reduced as much as 30 per cent while these more efficient joints permit a substantial saving in lumber also. Time and labor are saved in erection, producing more economical structures with sound architectural lines.

#### Types of Connectors

The three types of timber connectors most generally used in timber highway structures are spike grids, split rings, and shear plates.

A *spike grid* consists of four rows of opposing spikes forming a  $4\frac{1}{8}$ -inch square grid with sixteen teeth held in place by fillets. Flat grids are installed between framed trestle posts and braces. Single-curve grids are used in pile-trestle construction between the curved face of the pile and flat sawn bracing. This stronger and more rigid connection permits the trestle structure to act more nearly as a unit, thus reducing vibration and the possible loosening of joints. Wind loads, too, are easily carried through the spike-grid joint. Grids are installed by being forced into the wood with a special inexpensive high-strength rod and ball-bearing thrust washer assembly, or with hydraulic clamps. The grids have been carefully designed so that, when installed in properly pressure-treated lumber, the teeth penetrate only a small fraction of the depth of treatment, without harm to the preservative seal. Also, the pressure exerted on the wood by the teeth as they are inserted causes the treating fluid to flow around the teeth and completely fill any small checks which may develop.

The *split ring*, made in  $2\frac{1}{2}$  and 4-inch diameters, is a mild-steel circular band, beveled to permit easy insertion in the groove, and cut through at one place to form a tongue and slot. Placed in pre-cut circular grooves between adjacent faces of overlapping members, it provides a much larger bearing area for transferring loads than other methods of joining timbers. Tools for routing the grooves to receive split rings are operated by standard portable compressor or electric-generator equipment. Split rings are used wherever two or more overlapping timber members come together in a joint. As an illustration, visualize a typical Howe truss with solid  $12 \times 12$  chords and vertical tension rods. For split-ring construction, the chord is separated into two  $6 \times 12$ 's and the vertical may be a  $4 \times 12$  instead of a steel rod. The end of the  $4 \times 12$  is inserted between the two chord members, and split rings are installed in the overlapping faces. A direct transfer of stress is thus made between the chords and vertical through the split-ring connectors.

*Shear plates* are manufactured in  $2\frac{1}{8}$  and 4-inch diameters, the smaller being

pressed steel, the larger, malleable iron. Each is a circular plate with a flange around the edge at right angles to the face, extending from one face only, and with a central bolt hole. Shear plates are placed in pre-cut grooves or daps made by routing equipment similar to that for split rings. Developed primarily as aids to the demountability of timber structures, shear plates are widely used in strap and pin timber construction, gusset-plate construction, foundation connections (all wood-to-steel connections), and wherever construction or erection joints require the sliding of one member between two others (wood-to-wood connections). Unlike spike grids and split rings, which transmit loads directly from one member to another (the bolt merely holding the adjacent

members in position), shear plates transfer loads through the bolts themselves.

#### Large Clear-Span Structures

Since the joint has commonly been known as the weakest part of any timber structure, the development of timber connectors has enabled engineers to design a multitude of economical timber highway structures all the way from framed trestle bents spaced 15 feet apart to through trusses 210 feet in clear span, and arches of 200-foot span. It is interesting to note that the U. S. Navy used the arch principle, lumber, and connectors in building the largest clear-span timber structures ever constructed, gigantic blimp hangars 197 feet high, 1,000 feet long, and clear-spanning 237 feet.

The many timber bridge trusses, through and deck types, constructed along the Alaska Highway, serve to illustrate the scope of engineered timber roadway structures and the part played by timber connectors. (See C&E.M., November, 1943, page 11, Sikanni Chief



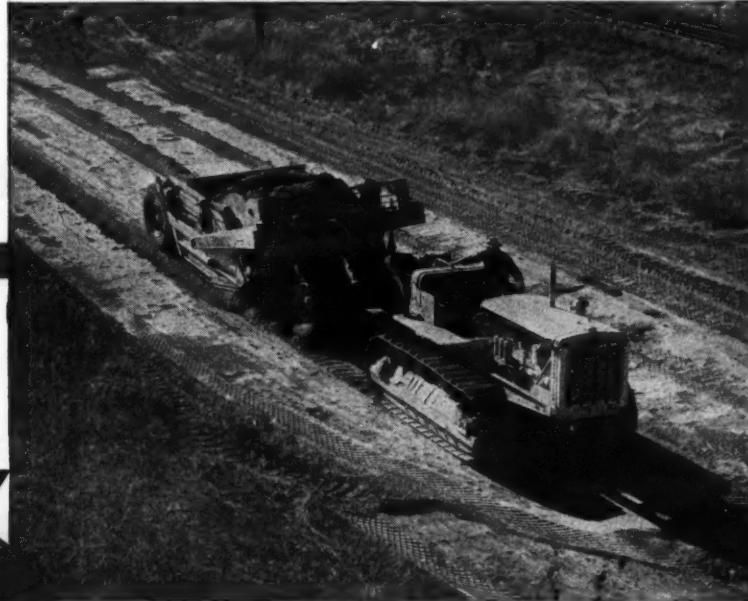
"By George, that settles it! We need some new trucks!"

River Bridge; and December, 1943, page 21, Kiskatinaw River Bridge).

#### Economics

The older designs of timber bridges required metal for rods, hardware, and

(Concluded on next page)



If you've had difficulty obtaining delivery of certain LaPlant-Choate models, please remember that dozers and scrapers continue to rate top priority as essential weapons of war. Moreover, again this year, LaPlant-Choate is producing more dozers for the armed forces than any other company in the industry.

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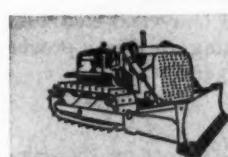
Ask any of the thousands of satisfied owners who have used LaPlant-Choate equipment for years—and they'll tell you that you can't beat a LaPlant-Choate rig for saving time and money on the job. This LaPlant-Choate record of performance and economy—proved on tens of thousands of jobs the world over—will be even more evident in the new improved LPC earthmovers now being engineered for thrifty mass production after Victory. So before you buy any new earthmoving or land clearing equipment, be sure to look for the new LPC trademark. Backed by 34 years of specialized engineering and manufacturing "know-how", this new mark is your assurance of lowest possible cost per yard . . . per ton . . . per acre. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa.

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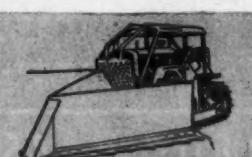
**ALL TYPES OF DOZERS**—Straight or angling blade, hydraulic or cable operated, for every size of track-type tractor.



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# Timber Structures

(Continued from preceding page)

expensive heavy cast-iron shoes, as well as excessive amounts of timber to provide adequate sections where chords were spliced. The use of timber connectors, however, has removed these disadvantages, permitting more economical chord designs, and utilizing the natural strength of timber tension members in the web systems.

A short time ago the bridge engineer of one of the western states said that he would be interested in treated-timber deck trusses provided the cost was \$125 or less per linear foot for 24-foot roadway structures. An indication of what may soon meet his requirements is a series of three 68-foot-span lattice-girder bridges, plus 525 feet of pile, framed, and concrete trestle bents, recently completed under wartime conditions in central Washington. Since these structures have a clear roadway width of more than 28 feet, the comparison is not exact, but even so, the total cost was \$118.50 per linear foot, or equivalent to approximately \$100 for a 24-foot roadway. Thus, even under the pressure of wartime prices, a saving is indicated in the construction of pressure-treated lumber structures with connectors.

#### Other Uses

Shortly before the war, the Ohio Department of Highways completed a high-level concrete viaduct of six two-rib arch spans over the Little Miami River at Fosters Crossing. From a construction point of view, the chief interest in this project lay in the use of wood-truss centering for the arches, fabricated at the site with split-ring connectors. The contractor for the bridge selected an arch type of centering for several reasons. Wide clearance was required because of heavy traffic beneath and the possibility of floods. Timber was chosen because it indicated a saving in cost, permitted fabrication at the site, and allowed salvage of material for reuse in building falsework for the deck structure.

Before the development of timber connectors, the high cost and excessive deformation of timber truss-type centering were generally considered undesirable where intermediate support could be used. A common difficulty with tim-

ber-arch centering has been the development of cracks at the haunches, due to distortion of the falsework, but the connector type of design has eliminated this difficulty entirely. For the Ohio viaduct, the centering for each span, ranging from 136 feet with a 44-foot rise to 157 feet with a 61-foot rise, consisted of two three-hinged arch trusses latticed together to form the support for one concrete rib. After one rib of a span was poured, the centering was shifted sideways into position for the second rib. The trusses were set slightly high at the crown to allow for deflection under load, but they proved to be remarkably stiff, as indicated by a maximum deflection of about  $\frac{3}{4}$  inch under full load.

Connector use in the highway field is by no means confined to trestles and roadway bridges. Built-up timber girders for pedestrian overpasses, with split rings to develop shear between laminations, present an attractive appearance to oncoming traffic, and have proved their economy. Bowstring trusses, framed with connectors, also give pleasure-

ing architectural outlines. One of the most outstanding was recently completed in southern California with wood, glue, and timber connectors, combined in bowstring trusses 175 feet in clear span. The upper and lower chords were glued up of kiln-dried 2 x 6's, eliminating possible future shrinkage problems. All web-to-chord connections are made with split-ring connectors. Shear plates and steel gussets make strong efficient chord splices with a minimum of cross-section reduction.

In the years immediately before Pearl Harbor, states, counties, and municipalities gradually found themselves becoming the owners of more and more road construction and maintenance equipment. Mr. Smith pointed out in his paper that in 1944 it was estimated that equipment replacement charges in Utah alone would be \$550,000 in each of the first three years after the war. Such equipment must have proper care, which includes housing in sheds, garages, and warehouses. Timber-connector roof trusses in over 60,000 buildings testify

to the value of such construction. It is no longer necessary to confine the design of a wood-roof truss to the old-style Howe rod and block system. Wood and connectors lend themselves equally well to a variety of types and shapes such as pitched Belgian and Fink trusses, flat Pratt and Warren trusses, scissors for increased headroom, saw-chord and laminated-chord bowstrings for economy, saw-tooths for interior lighting, and cantilevered roofs for loading platforms and sheds.

#### What IS Maintenance?

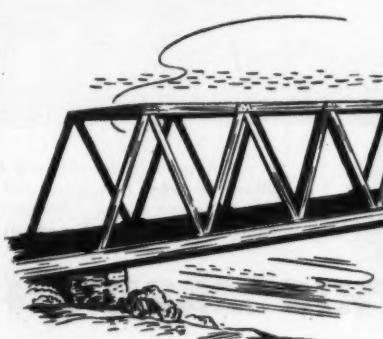
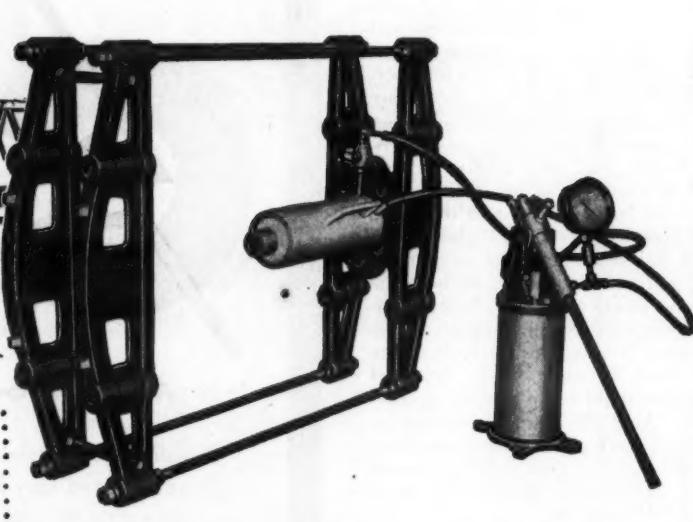
Maintenance is defined as "the act of holding or preserving in any particular state or condition". Highway maintenance has been defined as being the immediate service rendered to the traveling public by keeping the road surface smooth, by providing conveniences and safety devices for traffic on both improved and unimproved state roads, and by affording protection for the investment made therein.

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7415 Walker Street, St. Louis Park, Minneapolis 16, Minnesota.

## Charles W. Smith, Road, Ship Builder

(Continued from page 8)

a smooth finish, we got the tractor manufacturers to remove the grouser treads and install a slick track."

In the meantime, Smith married the girl who had attracted him to western Florida, and had established his headquarters in Pensacola which was to become the Annapolis of the air, ringed about by numerous airfields. Better equipment for road-mixing was developed and made in the Smith shops in the form of triple-blade maintainers and 26-inch potato plow disks. In 1936 the Smith brothers bought out their former partners and now the business is all Smith.

The popularity of sand-asphalt pavement throughout the Gulf Coast increased rapidly, and in 1939 when the Navy at Pensacola started a big expansion program, involving several million square yards of new sand-asphalt runways, and the Army decided to build Eglin Field at Valparaiso, Fla., laying 6,000,000 square yards of sand-asphalt runway, Smith realized that his road-mixing machinery was inadequate. He brought six Wood Roadmixers from California to Florida, redesigned them to suit local conditions, and met the Army and Navy demand to build runways faster, better and cheaper.

### Business Grows

The business has grown steadily over the years. In 1929 when the company was formed the gross income was around \$50,000. Two years later, after the first sand-asphalt runways were built, the company showed a gross income of \$350,000 which expanded in 1943 to \$5,750,000; yet the organization is well balanced and controlled and handled conservatively. Equipment is constantly maintained and improved and is today probably the best in the country for the type of work for which it was assembled.

No small factor in the success of the business, aside from the driving energy of the two brothers, is their personal charm. Charles W. is no doubt aware of this asset for he makes as many of his business contacts as possible in person.

The most extraordinary feature of Smith's personality is his calmness, which is not the most usual trait found in contractors. Nothing or nobody ruffles him and he in turn ruffles nobody. He lives quietly and simply with his wife and three children, Charles Jr., 12, Shirley 10, and James Shelby 7, in a roomy home, with camellias and azaleas

growing around the lawn, in a manner which we like to consider typically American, where a blessing is asked before meals and Mrs. Smith entertains on the piano. He drives a cream-colored Fleetwood Cadillac but his 42-foot Wheeler cabin cruiser gets little play these days. The shipyard takes so much of his time that he no longer can play golf which he shoots in the low 70's. The only vacation he ever had was four years ago when he broke three ribs in an auto accident and had to keep quiet for two weeks.

Until he got into the ship-building business, Smith had his office at his contracting plant which occupies 10 acres outside of the city. There he enjoyed the luxury of an air-conditioned building of hollow-tile construction and could look after his equipment which was serviced in a 65 x 95-foot machine shop. This equipment ranges all the way from a \$50 portable hook-on rock spreader to a \$63,000 Simplicity asphalt plant with a capacity of 2,000 tons per day, or a \$90,000 Cedarapids Morok crushing

plant.

The Smith Brothers also own and operate the West Florida Truck & Tractor Co. which for the past eight years has been an agent for International Harvester motor trucks and farm machinery. Prior to the war this concern showed profits of about \$10,000 a year and now has a net worth of \$20,000 and no debts.

### Shipyard Blues

"I can't do much else now but stay at the shipyard all the time," said Smith. "Shelby looks after the road and airport work that we do but I seldom get away from the yard. Out on the golf course when my golf cronies hear the shipyard whistle blow its kind of mournful sound, they say 'There's Chuck Smith moaning 'cause he can't get out here and play golf'. And they are not far from right."

Smith did get away from town long enough in January to attend the convention of the American Road Builders' Association when he was elected President of the Contractors' Division of which he had been Vice President. He

has also been President of the Florida affiliate of that association. On one of his other infrequent trips away from Florida, he presented arguments before the Committee on Ways and Means of the House of Representatives and the Senate Finance Committee at Washington against provisions on the renegotiation of contracts which are entered into competitively. Smith made his point in each case and was thanked by the law makers for his contribution to the information on the subject.

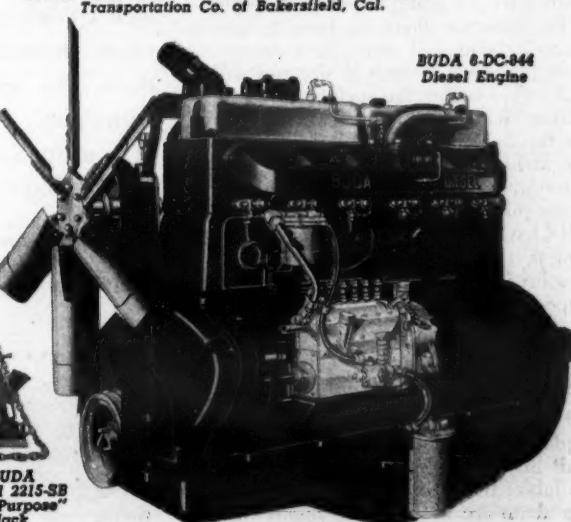
The Smith companies have been cited by the Commanding General at Eglin Field for the speedy construction of installations of a secret character, and by the Mobile District, U. S. Engineers, for which the Smith Engineering & Construction Co. performed about \$6,800,000 of construction.

### Post-War Plans

Charles W. Smith is not the type to rest on his laurels. He knows that the end of the war will bring an end to this  
(Concluded on next page)



BUDA Diesel powered Highway Tractor with double bottom tank trailers hauling gasoline for Empire Transportation Co. of Bakersfield, Cal.



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# Charles W. Smith, Road, Ship Builder

(Continued from preceding page)

government ship building and he has planned accordingly. Here is one private contractor with a definite post-war plan, simple, yet complete to the last detail; not a visionary scheme, but a conservative workable diagram.

"As facilities are released after the war," said Smith, "we hope to convert and expand them by an expenditure of about \$200,000 initially, and carry out a five-point program of operations and services which should employ at least 140, exclusive of office workers, and do a gross business of \$1,000,000 annually.

"First we want to use our machine shop and build a small foundry for repair service for surrounding industries, coastwise shipping, contractors' and farmers' equipment, etc. At present there is a lack of adequate machine-shop and foundry facilities around Pensacola.

"Second we hope to improve our steel fabrication and plate shop, and take advantage of the low freight rates from Birmingham, Ala., on steel and iron. We expect a ready market for fabricated structural units for use in small buildings, bridges, industrial plant expansion, culverts, tanks, etc. Also we want to ship our products to Central and South America to make up return loads for the mahogany they will send us for use in our woodworking and furniture plant which is the third point in our program.

"There is a market in the hot, damp climate along the Gulf Coast and Florida for solid mahogany furniture which stands up much better here than the veneered or laminated products used in the interior. There is a lumber company just across the bayou from us which imports mahogany logs, cuts them into boards, and sends them to the mid-west furniture factories. We could make furniture right here at a big saving to the people in this area.

"Fourth we want to install a marine railway capable of handling ships of from 1,000 to 1,500 tons up to 300 feet long. A railway with a 48-foot beam can do this nicely. There is much floating equipment in this area, plus coastwise shipping, that needs such a place for servicing.

"Lastly we are going to erect a suitable servicing garage of 15,000 square feet at a cost of \$50,000, with show rooms for our truck sales agency. We expect to sell trucks, tractors, and farm equipment as well as provide service for this kind of equipment, and with our fabricating and machine shops build special truck trailers."

Visionary? No. Smith is already grading the site for the fifth point in his program and has plans drawn for the building which will be erected at the end of the war.

"This building will be built with the comfort of the mechanics in mind," said Smith. "We are going to put steam pipes in the concrete floor to furnish heat where it is needed most in a garage. These pipes are  $\frac{3}{4}$  inch in size and will be 2 inches below the surface in 2-foot spacing. Water at 85 degrees will circulate through these pipes. It is an ideal way to heat a floor. The Romans used that system thousands of years ago but we are just catching up with them now."

If Charles W. Smith can think of anything that will give comfort to somebody else, he is happy. His post-war plans shape up that way.

## Welder's Pocket Guide

Fundamental facts about arc welding and the best methods for the successful employment of this technique are covered in a vest-pocket-size guide now available. In addition to basic information about arc welding, this handy little

book gives instructions on proper angles, hints for determining the quality of weld, essentials of procedure, and a trouble check-chart which affords a means of quickly determining the cause for unsatisfactory results. Welding symbols and other useful reference data are also included.

Copies of the Welders' Vest Pocket Guide to supply every welder in your plant may be secured from Hobart Brothers Co., Box CE-45, Troy, Ohio.

## Colombia's Program For Road Improvement

The National Government of Colombia, South America, has appropriated 7,120,000 pesos (a peso equals 57 cents) for the construction and maintenance of roads in 1945, distributed among fourteen separate zones. In addition, 300,000 pesos has been allocated for the purchase of equipment and 130,000 for asphalt.

There is reported to be enough asphalt

in the beds of Tuta and other municipalities of Boyaca to pave the major portion of the national highways, as only the main trunk lines are to be paved.

Announcement was made in January by the Minister of Public Works that the wharf at Santa Marta was being widened, and that work on the main highway from Bogotá, the capital, to Santa Marta, known as the Troncal de Oriente, will be continued with the object of us-

ing Santa Marta as the port for the Departments of Boyaca and the Santanders. It is expected that the Carretera Central del Norte, which starts on the Venezuelan border and crosses the country to end in Ecuador, will be paved within five years. A total of 600 workmen were added to the personnel building the thoroughfare from Medellin to the sea in order to finish the great Trans-Andean highway in May.

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Here's a new handy help for you in choosing the right wire brush for your jobs. Tells at a glance the proper types, sizes, styles, capacities and running speeds for top efficiency and maximum economy. Featuring handy, easy to read charts, this new Thor bulletin saves time . . . prevents disappointing results. You'll like the new, simplified pricing system, too. This time-saving bulletin is ready for you. Get your copy today. It's free without obligation.



### Thor "top" quality industrial wire brushes can "take it"!

Scientifically constructed for long life on tough jobs, modern Thor wire brushes can be operated efficiently at speeds of 2000 to 6000 r.p.m., depending upon the type of job to be done. The brush sections are heavily filled with doubly durable crimped wire in gauges of from 30 to 36 and can be had in sizes from 4" to 12" outside diameter.

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Wire Wheel Brushes



Air Hose Couplings



A typical sign assembled from segmented sections of porcelain-enamelled steel.

## Airway Guide Posts For Post-War Fliers

With the inevitable upsurge in flying after the war, air travelers and private plane owners will be looking for more guide posts to tell them where they are. Permanent, easily seen and easily read signs conforming to standard aeronautical practice would be of great help to all who indulge in air transportation. Such signs might designate the town, latitude and longitude, direction and distance to the nearest airport, or identify a factory or important landmark and at the same time indicate the route to the nearest airport or landing strip.

Such signs can usually be installed on large conspicuous roof surfaces, such as county or state highway shops and garages, in or near the center of a town or city or near a main highway intersection or railroad. Their location should be such as to provide good visibility from all angles at an elevation of 3,000 feet. Air markings can now be installed in the United States with the exception of a restricted strip of 150 miles inland along the west coast. The Civil Aeronautics Administration recommends a black background and the use of chrome-yellow characters as being the most visible, or the use of white when ground markers are contemplated.

Porcelain enamel on steel has demonstrated its suitability for permanent signs and has been widely used for all types of markers, highway signs, and street signs. Any desired color is readily available and the finished product is bright, weatherproof, fireproof, sturdy, permanent, and self-cleaning.

To provide permanent markers which will not become faded by weathering, the Market Development Division of Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30, Pa., has designed a series of porcelain-enamelled steel segmented sections which can be readily assembled into letters, figures, or symbols as desired. These enamelled steel segments can be made by any porcelain-enamel plant and shipped in compact boxes, each containing the segments for a letter or character with detailed directions and the necessary screws and washers for quick and easy assembly on the surface selected. The height of letters, sizes, colors, shapes, and widths of strokes in the proposed segmental enamel markers all conform to the CAA standards.

Complete information regarding these signs may be secured by writing direct to the Carnegie-Illinois Steel Corp. Market Development Division, and mentioning this descriptive text.

## Farmers Back Bill For Rural Road Work

Farmers, through the State Agricultural Association, are taking a great interest in the post-war secondary-road program in Illinois, to the point of introducing bills in the State Senate and House proposing the appropriation of \$10,000,000 per year from the general surplus funds of the state for farm-to-market roads. The bills provide that the county superintendents of highways, in cooperation with the township commissioners, shall select the roads to be improved. These roads are to be township or road-district roads and preference would be given to school-bus and mail routes.

The bills further provide that the county superintendents of highways and the township highway commissioners prepare the plans for the improvement of these roads and file them with the

State. The townships would do the grading and build ordinary culverts, and state funds would be used for the surfacing. Present rights-of-way would be used and only the minimum amount of grading is to be required.

The State and counties are authorized to acquire surplus road-building machinery and equipment from the United States government, as it becomes available, for use on these roads.

The bill would appropriate \$20,000,000 for the biennium beginning July 1, 1945, not more than \$10,000,000 to be used in any year. If Federal funds are used for the construction of these roads, then the State appropriation will be reduced by the amount of the Federal funds so used.

### The Viscosity of Oils And Their Viscosity Index

An 8-page article on the viscosity of lubricating oils and the viscosity index appears in Volume XXXI, No. 4 of *Lubrication*, published by The Texas Co.,

135 East 42nd St., New York 17, N. Y. The article contains a simplified definition of these two terms and a detailed discussion of the significance of various tests, with a comparison chart, a blend-

ing chart, and other data of value to those in charge of the purchase and use of lubricants.

Copies of the article may be secured direct from The Texas Co.

Write  
for  
Details



## A TOUGH ROLLER FOR TOUGH JOBS

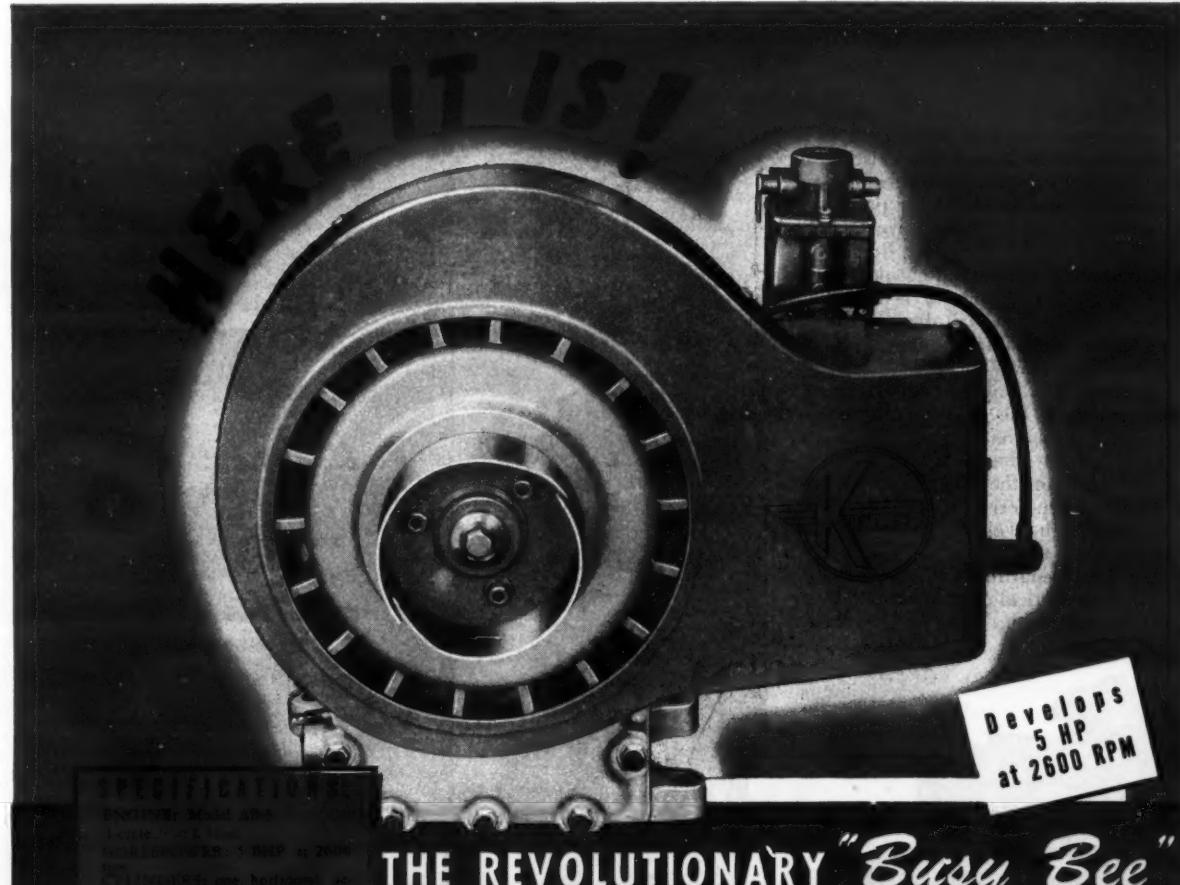
Pierce-Bear 2-5 Tons  
Variable Weights

Engineered for economical operation where the going is tough. Compact, easy to operate. Narrow rear roller gives heavy-duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy-duty Model "B" gasoline engine.

Manufactured by

**H. W. LEWIS EQUIPMENT COMPANY**

431 Hesston Avenue  
SAN ANTONIO 3, TEXAS  
Phone, Garfield 6137



### SPECIFICATIONS

ENGINE: Motor A-60  
1 CYLINDER  
DISPLACEMENT: 5 cu. in.  
RPM: 2600

WEIGHT: One, horizontal  
200 lbs.

STROKES: 1/2 inch

VISION: Replaceable

COMPRESSION RATIO: 5.4 to 1

FUEL: Gasoline fuel or kerosene

COOLANT: Air from 100° and 200°

LUBRICATION: Full pressure

from oil pump w/ oil bath

WEIGHTS: 200 lbs.

IGNITION: High-Tension Elec.

WHEEL: Spoked

GEAR: 1/2" x 1/2" x 1/2"

CARBURATOR: Down draft w/

More over air cleaner

WEIGHTS: 75 lbs.

SPACE OCCUPIED: 2-1/2 Cu. Ft.

Height 17 inches, width 18 inches

length 27-1/2 inches

CRANKSHAFT: Steel w/ hard

case and ground journals. Dry

vacuum balanced

CONNECTING ROD: Dual

PISTON: Cast aluminum

PISTON PIN: Steel, hardened and

tempered

VALVE SEAT INSERTS: Two, of

hardened steel

HEAD: Aluminum alloy, heat

resistant

CRANKCASE AND BEAR

COVER: Aluminum alloy, heat

resistant

VALVES: Two, 1-15/16 inches

COMPRESSION RINGS: Two of

hardened steel

CONNECTING ROD LENGTH:

8 inches

PISTON DIAMETER:

4-1/2 inches

PISTON PINS:

### HIGH PERFORMANCE RUGGED LIGHT

The revolutionary "Busy Bee" engine embodies principles which are new as applied to small engine design and manufacturing. Daring in design and engineering, it has these unique features:

- Rated at 5 HP, it actually develops 6 at 3250 rpm.
- Aircooled, 4-cycle, L-Head.
- Horizontal cylinder, detachable—easily replaced.
- Simple, clean design makes maintenance easy.
- Light metal alloys make it lightest engine in its horsepower class—very advantageous for portable units.
- Aluminum head, piston and crankcase materially improve cooling characteristics.
- Full pressure lubrication to all bearings.
- Flat torque curve—the "Busy Bee" will "lug" under heavy loads.
- All bearing surfaces hardened—for longer life.
- Bearings large—bearing pressures low.

The Kinner "Busy Bee" is built for universal service under all conditions. Write on your letterhead for illustrated brochure, engineering data, KINNER MOTORS, INC., GLENDALE 4, CALIFORNIA.

# New Steel Bridge Will Eliminate Traffic Jam

**State Plans Post-War Job At Annisquam Crossing of Mass. Route 128; Road and Water Traffic to Benefit**

THE mile-long traffic tie-ups that were the rule on the road going in to Gloucester, Mass., in the pre-war days of open motoring will be absent in the post-war era, according to the plans of the Massachusetts Department of Public Works. A new high-level bridge will be built across the Annisquam River, connecting Cape Ann with the mainland. At present, besides the Boston & Maine Railroad trestle, the only access into Gloucester and Rockport, whose summer population is about 30,000, is the Blymann Bridge, a small double-leaf Scherzer roll-lift span. This is located at the north end of Gloucester harbor on Route 127 just to the west of the Fisherman's Monument.

Many pleasure craft ply the Annisquam River, which is really a canal connecting Annisquam and Gloucester harbors, to save a long trip around Cape Ann when coastwise bound. The existing bridge has but 6-foot clearance at the center and so must be lifted for practically anything larger than a rowboat going through. The Blymann Bridge, with a 33-foot roadway width, spans a 40-foot channel, and since it is raised and lowered continually during the boating season traffic jams are inevitable.

The new high-level bridge will be located about 1½ miles north of the present bridge at the only high point which would form a natural site. On the west bank is Rust Island with a 50-foot elevation, while on the east side of the river 65-foot-high Ferry Hill will serve as the other high-level approach. Permission to build the bridge was secured from the War Department which stipulated a 65-foot vertical clearance for 100 feet of channel width. These conditions

are satisfied in the present plans. The present bridge will remain undisturbed to accommodate local traffic along the shore road.

## Design of Bridge

The main span of the new bridge will be a deck steel-plate-girder arch 420 feet from center to center of bearings. The approach spans will be the deck steel-plate-girder type, and will make the total bridge length 860 feet. The floor of the bridge will be 95 feet above low water. The bridge width of 57 feet will carry two roadways, each 25 feet wide, separated by a 4-foot strip of concrete, and two concrete sidewalks of 4-foot width. The bridge paving is to be bituminous concrete with granite curbs, while the approaches will be paved with a 7-inch



Massachusetts Department of Public Works Photo

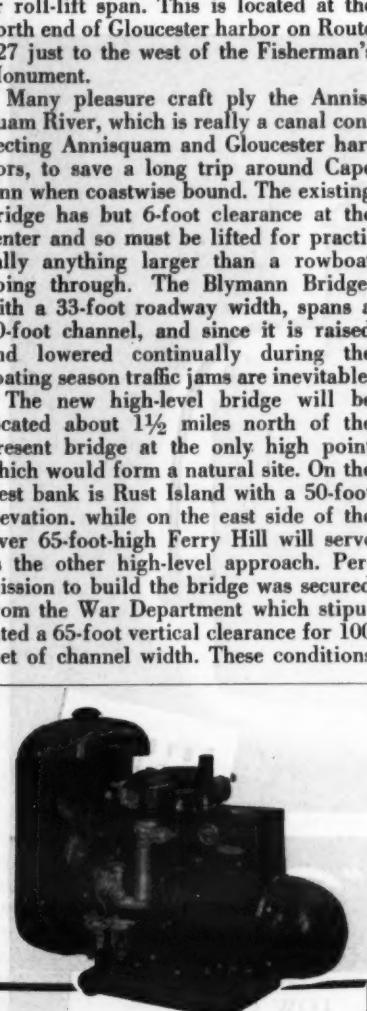
A model of the proposed new arch bridge over the Annisquam River at Gloucester, Mass., looking north.

broken-stone penetration-macadam surface separated by a 4-foot granolithic strip.

The two main piers will have a 50 x 100-foot base of solid concrete faced with granite masonry. Each pier will have two columns whose tops will be 105 feet above mean sea level or 16 feet above the bridge floor. The Rust Island pier will rest on ledge at an elevation of 16 feet below mean sea level. Ferry Hill

pier will have a similar foundation with grade at 12 feet below mean sea level. The solidity of the foundation material is attested by core borings in solid rock. An unbroken core ¾ inch in diameter and 7 feet long was recovered from one of the test borings on the Rust Island side. Cofferdams will be used in pier construction but no major water trouble is expected. The four bridge towers will

(Concluded on next page)



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Driven by Onan-built, 4-cycle gasoline engines, these power units are of single-unit, compact design and sturdy construction. Suitable for mobile, stationary or emergency service.

Models range from 350 to 35,000 watts. A. C. types from 115 to 660 volts; 50, 60, 100 cycles, single or three-phase; 400, 500, and 800-cycle, single-phase; also special frequencies. D. C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or detailed literature.

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This is the story of how one basic engine, a favorite everywhere it runs, has become a winner even in applications which demand two to four times its power.

The engine is the General Motors series 71 Diesel which, back in peaceful days, showed the world what dependable low-cost Diesel power could do on farms, highways and on scores of construction projects where developments in progress were quick to recognize the advantages of packing more power into less weight and space.

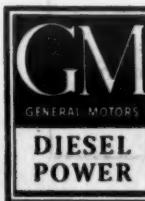
It's busy now all over the world powering landing craft and machinery that is building landing strips and leveling jungles.

Where double the power is needed and space is cramped, two engines are joined side by side. Such "Twins" are used in M-3 and M-4 tanks and M-10 destroyers.

In its third form, two "Twins" are joined end to end, forming a "Quad." It is two of these "Quads" that drive the twin screws of the famous LCI's (landing craft infantry), fastest of all landing craft.

But whether "Single," "Twin" or "Quad" these GM series 71 engines are promising many advantages for power users on big jobs and little. With a range of horsepower to fit almost every need, the GM Diesel will be a good bet for everyone who wants dependable power at low cost.

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LOCOMOTIVES

ELECTRO-MOTIVE DIVISION, La Grange, Ill.

## New Steel Bridge

(Continued from preceding page)

contain storage rooms and will also provide access to the under part of the superstructure.

The steel spandrel columns of the arch will be unbraced, which gives a light, clean, graceful appearance to the structure somewhat similar in design to the new bridge over the Niagara River. Lateral bracing is provided in the plane of the floor system and arch ribs.

A major problem will be obtaining sufficient material for the approach fills, as little borrow is available in this vicinity where shale rock predominates. Department engineers are considering the pumping of hydraulic fill from the river bed to increase the elevation of Rust Island and Ferry Hill to 80 feet.

### Part of Circumferential Route

The bridge is part of a new circumferential highway system, Route 128, a section of which is already completed from Lynnfield to Beverly. This new road is a typical Massachusetts "double barrel" highway consisting of two 24-foot paved strips with a dividing center strip. The section in the post-war plans is 2½ miles long and will run from Essex Avenue on Route 121 in West Gloucester to Washington Street, Route 127, in Gloucester itself. Besides the arch bridge, the project will include four grade separations and one small river bridge. The estimated cost of the entire project is in excess of \$2,000,000.

### Personnel

The design, both structurally and architecturally, was done entirely by the Bridge Division of the Massachusetts Department of Public Works, under the direction of R. O. Spofford, Bridge Engineer. Raymond W. Coburn is Chief Engineer of the Department. A scale model of the bridge was made by J. C. Rundlett of the Bridge Division.

### New Plastic Shield For Workers' Faces

Four new face shields which provide light-duty protection for such operations as metal sawing, acid handling, buffing, sanding, and light grinding have been announced by the American Optical Co., Southbridge, Mass. Three types of button-on windows for the shields have also been announced: clear cellulose acetate for general purposes; 24-mesh screen for heat protection; and fibre with a filter glass window for welding and scarfing.

The new face shields are light, comfortable, and sturdily made to withstand hard use. They are designed to be worn without discomfort by workers who wear prescription glasses. All parts are easily interchangeable.

The new AO F-100 face shield has an adjustable elastic headband which may be worn low on the head for additional comfort. Genuine leather sweatbands, like the windows, button on and are easily removed. A fibre headpiece holds

the device comfortably and firmly on the head. The shield may be instantly thrown up when not in use, and is held securely in position by friction joints. By removing a pivotal nut, spider and washer, instant interchange of parts is possible.

The F-200 shield has in addition a

standard spark deflector, while the F-300 is the same as the F-200 with the exception of the back headband which is of fibre construction, styled to fit the head snugly and comfortably. The long band slides within a fibre sleeve in the back, permitting easy adjustment to varying head sizes. The F-400 has all the fea-

tures of the F-300 shield, plus a full spark or head deflector, designed primarily for work in confined places where head bumps or lacerations may occur.

Complete information on these new shields may be secured direct from the manufacturer.

## IT'S NOT IN THE CARDS



**to equal the all-around performance of the "99-M"**

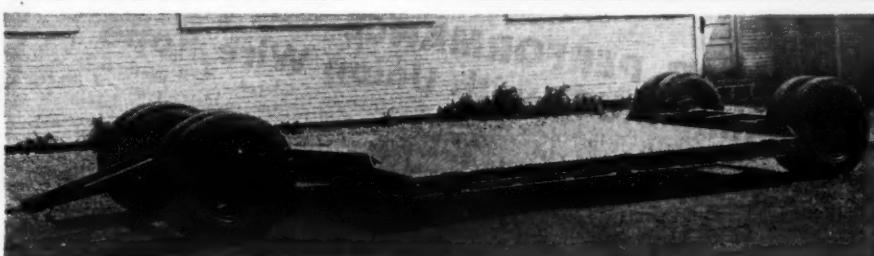
AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.



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7, 10, 15 & 20-ton capacities

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**FOR VICTORY**  
BUY UNITED STATES  
WAR BONDS AND STAMPS



Cartoon from ETO by Cpl. Glueck

"He's mighty proud never having missed a day of work since Pearl Harbor."

## Armco Studies Pipe Perforations, Position

An investigation has recently been completed by Armco Drainage Products Assn., Middletown, Ohio, to determine whether the 7/16-inch-diameter perforations in Armco Hel-Cor pipe, which have proved satisfactory in the past for plain and coated pipe where the backfill material has been coarse, would be satisfactory when the backfill is of the order of concrete sand as now required by U. S. Engineer specifications and by some state highway departments.

Prior to 1925, the features of corrugated-metal pipe, such as high crushing strength, long sections with positive beam strength, tightly connected sections, and overall durability, were recognized as the requirements of a satisfactory subdrain. Therefore, corrugated-metal pipe was used on many difficult drainage jobs, each lot of pipe being perforated specially for its job, usually as the customer specified. This practice was naturally costly and in 1926 the Armco Culvert Manufacturers Assn. made a series of tests to establish a standard method of perforating pipe, as to position, size and number of holes, which would be universally applicable to all types of drainage problems.

That investigation resulted in adopting a standard at that time of 1/4-inch holes in rows 1 1/2 inches apart and extending over the lower one-third of the pipe. Since that time, many thousands of feet of perforated pipe have been used successfully to solve many types of drainage problems.

In 1926, the same Association introduced Paved Invert, a type of asphalt coating and paving aimed to prolong the life of corrugated-metal pipe, especially when used as a culvert. The need for this improvement was soon recognized in certain subdrainage installations as, for example, on railroads. Therefore, in 1931 the perforating practice was revised to provide two groups of perforations, one group on each side of the unperforated invert and all perforations below the mid-diameter. The unperforated area provided space for protection and prevented collected water from reentering the soil where conditions permit.

In 1934, Hel-Cor, the new helically corrugated type of pipe, was introduced, as it was more economical to manufacture than standard corrugated-metal pipe. Most of this pipe has been perforated with the paved-invert type of perforation because a large portion of it has been coated and paved.

In order to facilitate keeping the perforations open in the coating operation, the size of the perforations was increased to 7/16 inch in diameter. The coating reduced the effective size of the holes to approximately the original recommendation of 1/4 inch, and it was not anticipated that, when the pipe was not coated, the larger holes would result in any difficulty, because at that time the general tendency was to use a rather coarse backfilling material around the pipe. In 1941, when the U. S. Engineers began the use of backfilling material of the nature of concrete sand, it was realized that some investigation should be made to check the proper position of the per-

forated area with the smaller-size grain of backfill material, the maximum size of holes that will prevent the infiltration of solids in a detrimental quantity, and the number of holes needed to permit the required amount of water to enter the pipe.

The first study was to determine the best location of the perforations which would admit the most water and the minimum amount of backfilled material. It was found that the least sand was admitted when the perforations were in the neighborhood of 60 degrees off the bottom. At the exact bottom and at the exact sides there was more and approximately equal infiltration of sand. Above the sides there was an increasing amount of sand admitted until the perforations were 150 degrees off the bottom and from there on it decreased.

As a preliminary to this investigation and to determine whether or not the spacing of the rows of perforations had any effect upon the structural strength of perforated pipe, careful tests were made, leading to the conclusion that the

loss of strength through the perforations is of minor consequence and not affected by the spacing of the perforations.

A careful study of the results of the various tests shows that when corrugated perforated metal pipe carrying no live load and not fully resting on the bottom of the trench, which is often the case when the beam strength of the pipe permits it to span low or soft spots, the perforations of the pipe should be in the zone from 30 to 60 degrees off the bottom, if the filter-material particle size is much smaller than the perforations, and that under these conditions the minimum amount of sand is admitted.

If the filter material is equivalent to concrete sand, the perforations must be in the neighborhood of 5/16-inch diameter to prevent damaging amounts of sand from entering.

Two rows of 5/16-inch holes on each side of the invert will admit all the water passing through the backfill material, or approximately 1.92 gallons per foot of pipe per minute. This is equivalent to 0.004 cfs or equal to 100 per cent run-off

from a 2-inch-per-hour rain on a 100-foot-wide paved surface. Looking at this from another angle, this is sufficient infiltration to fill a 6-inch pipe on a 0.5 per cent grade in 70 feet, or an 8-inch pipe in 150 feet.

Based on these results, standard perforated pipe and Hel-Cor pipe made by Armco will, in the future, have perforations 5/16 inch in diameter, plus or minus 1/16 inch. The rows of perforation will be centered about a line approximately 60 degrees off the bottom on both sides of the pipe, with the top row not higher than 22 1/2 degrees off the horizontal axis, leaving an unperforated invert of approximately 25 percent of the circumference of the pipe. At least two rows of holes will be used on pipes 6 inches and larger in diameter and the rows will be spaced approximately 1 inch apart.

The investigation was planned and carried on by H. E. Cotton and W. G. Lanterman under the supervision of G. E. Shafer, Chief Engineer of the Armco Drainage Products Assn.



## ★ ★ ★ FOUR STAR PERFORMANCE is a peacetime MUST with Union Wire Rope

In the battle to keep Old Glory flying, the Union Wire Rope organization is proud of winning the Minute Man flag and the Navy E Burgee with four stars signifying the limit of renewals for maintained excellence in war production. With war-sharpened skill our organization is determined to render four star performance in the service of private industry postwar.

In the meantime, our current advertising funds are devoted to furtherance of sound plans offering full opportunity for competitive private enterprise to survive and expand on a sound foundation.

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Tulsa 3, Monahans, Texas  
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Portland 10, Oregon

Kansas City 3, Mo.  
New Orleans 16  
Salt Lake City 13  
Ashland, Kentucky  
Atlanta 1

## Your Post-War Needs For Tools, Materials

The handling of post-war orders for equipment of all sizes, parts, and materials is a real problem. Contractors and highway departments want to "get in under the wire", and manufacturers want that stockpile of orders so as to know how to plan their production when the green light shines on civilian production again. A rational method of accepting orders and serving customers has been devised by Dresser Mfg. Division, Bradford, Pa. Any manufacturer may adapt it to his needs and every customer should do all in his power to aid all producers by handling their orders in the manner suggested.

Of course there will be a rush of orders to get inventories back to normal after the war, and the problem is to temper that rush with common sense in order to prevent disturbing production and insure a supply to all. Dresser, like many other manufacturers, is now accepting non-priority orders for post-war

delivery, but this company does not believe that Dresser products should be produced or distributed on that basis when the mad rush begins. This manufacturer wants all of its customers to have all of its products they need when they need them, and believes that the customers will cooperate towards the prevention of large unnecessary stocks because those who bought first took more than they needed immediately.

Here is the plan: A customer places a non-priority memorandum order to cover twelve months' needs following the lifting of stock restrictions. Such orders are permissible under the provisions of the Interpretation 11 of Priority Regulation 1 issued October 3, 1944. Customers are asked to tell the manufacturer how fast they will need this material when they are allowed to take it by quarterly shipments. The manufacturer will then study the orders and plan accordingly, bearing in mind the needs of all customers and not favoring the first few who placed orders.

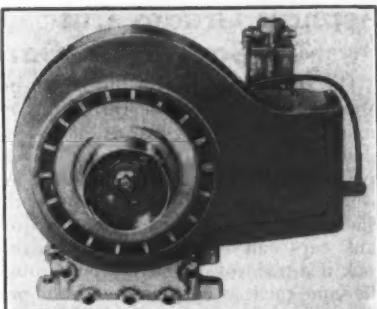
With a customer's non-priority memo-

randum order on file, it is possible for the manufacturer to keep his customers' requirements in mind, should there be an opportunity to produce some material on a non-priority basis prior to the war's end. But in no case will the manufacturer make shipment of any items without first requesting a formal order from the customer which will then be taken at prevailing prices.

It is believed that this plan will work to the customer's advantage and to the manufacturer's if the customer will now place a non-priority memorandum order for the first twelve months' requirements following the lifting of priority restrictions.

### Keeley Heads Prismo

Armand E. Keeley has been elected President of the Prismo Safety Corp., Huntingdon, Pa., according to a recent announcement. This company makes various types of reflective material and paints for traffic marking of highways and airports.



The 5-hp Busy Bee is a light-weight single-cylinder engine.

## New 4-Cycle Engine Of 5 Hp, Air-Cooled

A new 5-hp all-purpose air-cooled engine, called the Busy Bee and which embodies new features in small-engine design, has been announced by Kinner Motors, Inc., Glendale 4, Calif. This model, AB-3, is an air-cooled 4-cycle L-head engine rated 5 hp at 2,600 rpm, but develops 6 hp at 3,250 rpm. It has a 2 3/4-inch bore and a 3-inch stroke. The single cylinder is horizontal and detachable for easy maintenance. The whole unit requires only 2.4 cubic feet of space.

The light weight of the engine is due to the aluminum alloy used in the crankcase, piston, head, and crankcase and rear cover. It is especially adaptable for powering portable units and is reported to provide improved cooling with minimum attention. The power take-off shaft is 1 inch in diameter and rotates clockwise facing the shaft. The torque curve is practically flat, showing the ability of the engine to "lug" under heavy load conditions. Full-pressure lubrication is supplied by a positive high-pressure oil pump.

An illustrated brochure, containing additional engineering data, may be secured direct from the manufacturer by mentioning this news item.

## Greater Production Of Ethyl Chloride

An announcement which has immediate value in the prosecution of the war, but which also will mean a greater volume of anti-knock gasoline in post-war days, has been made by Ethyl Corp., Chrysler Bldg., New York 17, N. Y. A new process for making ethyl chloride, one of the most important chemicals used in manufacturing Ethyl fluid to produce high-octane gasoline, is to be in use shortly at the company's Baton Rouge, La., plant. The process yields ethyl chloride by reacting chlorine with waste products from one of the present ethyl-chloride units at Baton Rouge. It was developed in view of the tight supplies of both alcohol and ethylene, compounds used in producing ethyl chloride, through two present processes.

The principal use of ethyl chloride is in making tetraethyl lead by combining it with an alloy of lead and sodium. Tetraethyl lead comprises about two-thirds of Ethyl fluid and does the work in taking the knock out of gasoline.

## Road Work Planned In British Honduras

The 1945 highway budget for British Honduras, Central America, includes \$225,000 for construction and \$103,000 for maintenance, as compared with \$200,000 spent for construction and \$168,000 spent for maintenance during the 1943-1944 period, according to a recent item in *Foreign Commerce Weekly*. Plans for 1945 include replacement of the bridge over Roaring Creek on the Western Road, a highway which was the site of the major part of the 1943-44 construction.

The Colony now has a total of 131 miles of asphalt-surfaced and improved-earth roads, and 97 miles of non-surfaced, improved-earth, sand, clay, gravel, and dirt roads.

**UNION WIRE ROPE CORPORATION, 2192 Manchester Ave., Kansas City 3, Mo.**

- Send a Free copy of book entitled "The Road Ahead"
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## Asphalt Grades Cut To Save Tank Cars

The recent directive of the Petroleum Administration for War restricting refiners to only twenty-two grades of asphalt and road oils instead of the fifty-five to sixty different grades that are usually made was done to increase the efficiency of tank-car operations. More tank cars can be filled at the loading rack if a train of cars is moved through the same rack, as compared with the previous practice of moving cars from one rack to another for the blending of a special grade of asphalt.

The reduction of grades, which indirectly eliminates blending, will also speed up operations by requiring less switching of tank cars in the refining and terminal yards. An additional advantage is that the cars en route to one destination can be shifted to another destination if necessary, a practice that often is not possible when the maximum number of grades is manufactured.

The directive, which became effective

May 1, 1945 and is known as Petroleum Directive No. 80, restricts the manufacturer to eight specified grades of paving asphalt, nine grades of cut-back asphalt, and five grades of slow-curing road oil.

## Koehring Co. Dealer And Personnel News

New dealer appointments in all major construction areas have been announced by J. F. Robbins, recently named Sales Manager of the Koehring Co., Milwaukee, Wis., manufacturer of heavy-duty construction equipment. Mr. Robbins was formerly Vice President and Sales Manager of the C. S. Johnson Co., Champaign, Ill.

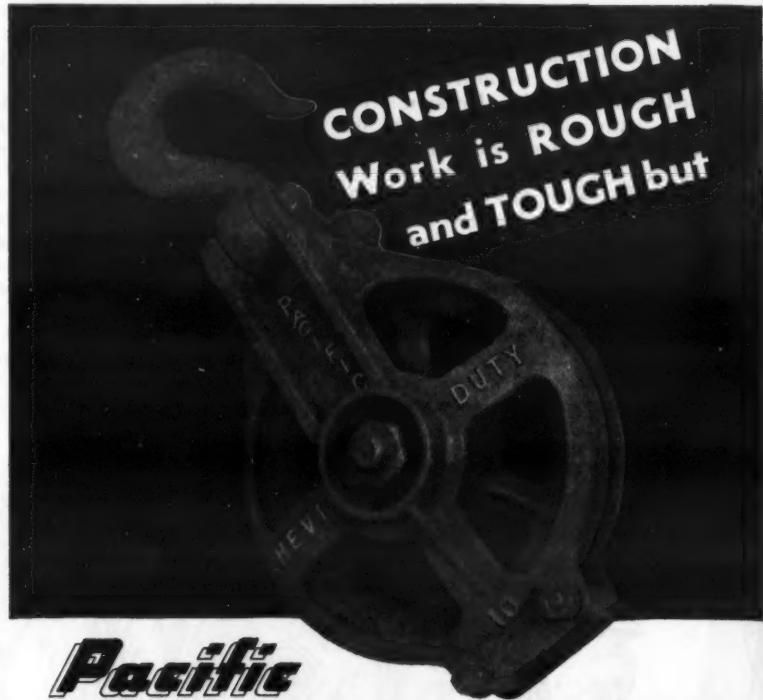
The new Koehring distributors are: for the western area, the Western Machinery Co., Spokane, Wash.; Columbia Equipment Co., Portland, Ore., and Boise, Idaho; Moore Equipment Co., Stockton, Calif.; and Harron, Rickard & McCone Co., Los Angeles, Calif. Other appointments are the Allied Construction Equipment Co., St. Louis, Mo.; At-

lantic Tug & Equipment Co., Syracuse, N. Y.; the Florida Equipment Co., Jacksonville, Miami, and Tampa, Fla.; and the Frantz Equipment Co., Philadelphia, Pa.

Factory representatives to service each construction area have been appointed as follows: F. S. Ray, for the southern

states; L. H. Belling, to cover the southwest; J. L. Lamley in the northwest; and R. E. Bansemer for the middle west.

William J. Reagan, Export Manager of the Koehring Co., and T. J. Bachhuber of the sales organization, have just returned from an extensive tour of Latin America.



## Pacific SHEAVE BLOCKS CAN "TAKE IT"



You can see how the sheave rims are recessed into the side plates so that the rope cannot be forced between them—you can see how the wide, deep flanges on the sheaves minimize rope wear on side plates—also see how the "snatch block" design permits quick, easy replacement of the rope.

What you do not see is that the sheaves, side plates, shackles and yokes are made of tough electric steel castings—that the bearings are well protected from dirt and water—and that both design and construction are based on years of experience.

But you will appreciate both "seen" and "unseen" quality long before your PACIFIC Sheave Block needs repairs or replacement.

Ask for your copy today.

## ALLOY STEEL & METALS CO.

1862 East 55th Street, Los Angeles 11, California

Manufacturers of PACIFIC SLUSHING SCRAPERS & SHEAVE BLOCKS • PACIFIC CRUSHING & SCREENING UNITS • PACIFIC ROCK BIT GRINDERS • PACIFIC ALLOY-MANGANESE MILL LINERS & CRUSHER JAWS • PACIFIC TRACTOR RIMS, CRAWLER SHOES & Wearing Parts



## Smooth Out your FLOOR PROBLEMS

## with PLASTIC ROCK!

Trowel a smooth, tough, plastic surfacing right over your old concrete or wood floor.

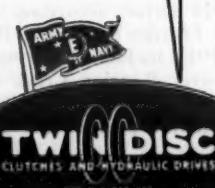
Plastic Rock comes complete, packed in barrels. Nothing more to buy. No application "formula" to confuse you. Simply mix and trowel right over old floor. Average depth one-half inch. Old floor Saturday is a new floor Monday. Also patches concrete to a perfect feather edge. Plastic Rock is absolutely

spark-proof, skid-safe wet or dry, dustless, silent. Feels like cork under foot. Cannot splinter, crack, crumble, curl or loosen. Heavy loads on steel wheels actually improve it. Five-year-old floors show no wear. Natural color is dark gray. Used by U. S. Army, Navy and largest industries in America. Your contractor or your own crew can apply. Write now for complete information.

Ask for your copy of Report 220-C

## UNITED LABORATORIES, INC.

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Export Division: WASHINGTON INTERNATIONAL SALES, Washington, D.C.  
In Canada: STORRAR MANUFACTURING COMPANY, Weston, Ontario



SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

# County Gets Ready To Meet Road Needs

## Hubbard County Seriously Plans for Road and Bridge Improvements After War: Stable Organization

By T. R. DAY, County Engineer, Hubbard County, Minn.

HUBBARD County, in north-central Minnesota, close to the headwaters of the Mississippi River, is mindful of the inevitable swing towards air travel following this war, but believes this will tend to increase the demand for more improved highways and better maintenance. Planning of a serious nature for future construction is now under way on ten separate road sections involving about 9 per cent of the total county road system. An Assistant Engineer, Ralph A. Larson, who was with the State Highway Department for many years, has been employed and placed in charge of making surveys and plans under this program. To date, about 35 per cent of this schedule has been completed.

The county is rectangular in shape, 42 miles from north to south and 24 miles from east to west, and includes 28 townships with a land area of 932 square miles or 596,480 acres. About 8 per cent of the total area is lakes filled with fish and surrounded by pine timber, a natural haven for thousands of deer.

The county population, as of the 1940 census, was 11,085, with Park Rapids, the county seat, having 2,647 people. The chief industries of the county are agriculture, dairying, and forestry, the last being extensive during this war period. The demand by the government for all types of wood products has been a strain on the local forests and, therefore, brought out the increased need for extensive reforestation. The climate is equitable, the altitude between 1,200 and 1,500 feet providing a bracing atmosphere.

The outstanding surface feature of the County is the Central Ridge, a rugged morainic belt crossing the county from east to west near its center, with the rolling till plain to the north and the smooth plain to the south. The Central Ridge is sharply rolling to very hilly.

### Roads and Types

U. S. 71 and Minnesota T. H. 34 bisect the county, with State Trunk Highways 64, 85, 87, 92, and 113 also playing an important part in completing the network of state arteries within the county boundaries. The county highway system consists of 518.86 miles of which 66.54 miles are State-Aid and 452.32 miles are county and County-Aid roads with an almost equal mileage of township roads. The basic county mileage as to type is as follows: bituminous surface, 17.48 miles; aggregate surface, 120.78 miles; soil surface, 208.25 miles; graded and drained, 97.97 miles; and unimproved, 74.38 miles.

### Maintenance

The normal maintenance organization consists of twelve men with forty-eight other part-time or seasonal employees. The County owns and operates, for the maintenance of its highways, two heavy-duty Adams diesel-powered graders; a Caterpillar Fifty tractor which alternates with either a LaPlant-Cheote C4 hydraulic scraper, an elevating grader, or a heavy blade grader; a 5-ton Oshkosh truck which is used mostly on snowplowing; and four 1½-ton Ford Marmon-Herrington trucks. In addition, for maintenance operations, the County rents two gasoline-engine-powered graders which are operated by their local owners in routine county maintenance. Swamp fill and major surface repair are made

with a rented Link-Belt Speeder shovel.

There has had to be an almost constant rearrangement of maintenance schedules and general county highway operations due to the war and its effects on personnel. This, in most instances, has made for decreased efficiency and ultimately poorly maintained roads.

### Bridge Survey and Care

There are thirty-three bridges on the regular road system which range from 16 to 392 feet in length and from 15 to 30 feet in width. Twelve of these have concrete decks and are of beam-span construction, while three are of treated timber and piling with laminated floors. One 392-foot bridge is entirely of untreated-timber and pile construction. Four are steel truss spans with untreated-

plank floors, while twelve are steel I-beam bridges with untreated-plank floors and there is one 24-foot timber span. Many of these bridges have steel-piling bents or foundations.

Bridge maintenance in most instances is performed by the regular truck crews, with special bridge crews set up only for new construction, in which case one experienced bridge foreman is obtained to supervise local labor.

An inventory of all bridges was made in 1944, and it was determined that a good many will need routine to major repairs, consisting of new floors, railings, piling, and painting, while others may have to be rebuilt to meet the needs of post-war traffic.

### Equipment Care

The servicing of county highway equipment is done through the strategic location of three county-owned garages. Two of these are at Nevis and Guthrie, each with a motor patrol and a truck. These garages are equipped to take care of minor repairs only, with no full-time

mechanic assigned to them. The third garage is at Park Rapids, the county seat, where all other equipment is centered. This main repair garage has a regular shop mechanic who has the use of such equipment as electric and acetylene welders, power drills, grinders, a lathe, compressors, and numerous other labor-saving devices. A parts room contains a large stock of needed repair parts and materials.

### County Organization

The county organization is comprised of five Commissioners whose term of office is four years. An election is held every two years with two members elected during the even election year and three in the odd. The County Engineer is appointed by the Commissioners for a two-year term. The present Engineer took over the duties of the Highway Department in January, 1943. This office handles the road system on a unit basis, rather than having an individual agency for each of the five districts. The present  
(Concluded on next page, col. 4)



## The Right Truck for All Trades

**There is a place for a pick-up in every business**

Chevrolet's popular pick-up truck is in production again—because the Government recognizes the importance of this versatile vehicle to agriculture, industry and trade, and their need for replacements. . . . Of course, production is limited—still, thousands of essential users will be enabled to procure these high-utility units. (Better see your Chevrolet dealer now, if your business makes you eligible to purchase a new truck.)

There is hardly a farm or a tradesman or an industry that cannot use a pick-up to good

advantage—especially a Chevrolet pick-up, with its unequalled combination of low price and high quality, plus its famous Chevrolet efficiency and economy of operation, its long life and durability.

These 1945 models are all-Chevrolet—with chassis, cab and pick-up box engineered and built by Chevrolet to meet Chevrolet's exacting standards of excellence.

Don't delay . . . see your Chevrolet dealer now and discuss your transportation and service requirements.

ONE OUT OF EVERY THREE TRUCKS IS A CHEVROLET  
CHEVROLET MOTOR DIVISION, General Motors Corporation, DETROIT 2, MICHIGAN

BUY MORE WAR BONDS...HELP SPEED THE VICTORY

# CHEVROLET Pick-up TRUCKS

### QUALITY FEATURES

STANDARD VALVE-IN-HEAD TRUCK ENGINE	MONORAIL SPARE TIRE CARRIER
SIX CYLINDERS	CAB: ALL-STEEL, STREAM-LINED
90 HORSE-POWER	FULL-WIDTH SEAT
CHASSIS RECIRCULATING-BALL STEERING GEAR	ADJUSTABLE CUSHION AND BACK
SHOCK ABSORBERS	V-TYPE VENTILATING WINDSHIELD
FULL-LENGTH BODY SUPPORT	SAFETY GLASS ALL AROUND
6.50-16, 6-PLY TIRES	BODY: INSIDE, 78 x 40½ x 16½ INCHES
SYNCHRO-MESH, 3-SPEED TRANSMISSION	MOISTURE-PROOF WOOD FLOOR
HYPoid GEAR REAR AXLE	UNOBSTRUCTED FLOOR (NO WHEEL-HOUSINGS)
HYDRAULIC BRAKES	ANTI-RATTLE TAIL-GATE
STABILIZED FRONT END	TUBULAR STEEL SIDE FLARE BOARDS
18-GALLON FUEL TANK	

## Prices of Equipment Over 5-Year Period

The prices of the major types of new construction machinery averaged about 11 per cent higher in December, 1944, than in August, 1939, according to the newly developed price index for construction machinery of the Bureau of Labor Statistics, U. S. Department of Labor. Prices began to advance shortly after the outbreak of the war in Europe and moved steadily upward through January, 1942. The largest part of the price rise was concentrated in the first eleven months of 1941. After January, 1942, prices remained relatively stable through 1944, except for slight increases in July and December of that year.

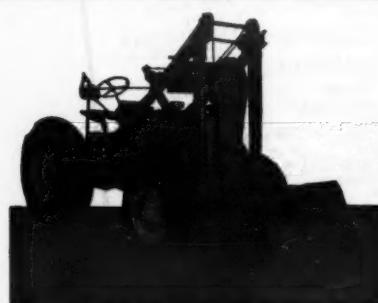
The trend in construction machinery prices from August, 1939, through December, 1944, as indicated by the table is of interest. Rising gradually at first, by December, 1940, prices had increased by 2.3 per cent from August, 1939. Beginning in January, 1941, however, prices rose every month, until by the end of November they were 10.4 per cent above their pre-war level. Except for an increase of 0.1 per cent in January, 1942, prices remained stable through June, 1944. In July, and again in December, 1944, prices advanced 0.1 per cent to a point 10.7 per cent above August, 1939, averages.

Price changes by individual groups of equipment ranged from a decrease of 2.1 per cent in the case of portable air compressors to an increase of 14.4 per cent for track-laying tractors as compared to the average increase of 10.7 per cent for all types. An increase in prices of tractor-mounted construction machinery in July, 1944, caused the composite index of construction machinery to advance 0.1 per cent. A similar increase in the general average resulted in December, 1944, from a rise in prices of mixers, pavers, spreaders, and related units.

The index numbers shown in the tables were developed recently by the Bureau of Labor Statistics and are published here for the first time. They are based on August, 1939, as 100 per cent and will be maintained on a current basis and issued quarterly in the future. The Bureau had the advice of industry representatives in the selection of the types of machines to be studied. This report is based on information obtained from seventy-one manufacturers of construction machinery located in the major producing areas of the country. Shipments of construction machinery by these companies during 1941 represented approximately 90 per cent of the total shipments of the industry for that year.

### Owen Joins Consultants

Mark B. Owen, formerly Director of the Committee on Post-War Construction of the American Society of Civil Engineers, has become a partner in the consulting organization of Russell B. Moore Co., 1456 N. Delaware St., Indianapolis 2, Ind. This firm specializes in airfields, municipal power and lighting, water works, sewerage, and refuse disposal.



### Front End Shovels

For Industrial Tractors  
Write for Descriptive Circular

**White Mfg. Co.**

ELKHART INDIANA

### Index Numbers of Prices of Construction Machinery.

August 1939-December 1944

(August 1939 = 100)

	1939	1940	1941	1942	1943	1944
January	100.6	103.2	110.5	110.5	110.5	110.5
February	100.6	103.6	110.5	110.5	110.5	110.5
March	100.6	104.2	110.5	110.5	110.5	110.5
April	100.8	105.0	110.5	110.5	110.5	110.5
May	100.9	105.5	110.5	110.5	110.5	110.5
June	100.9	106.2	110.5	110.5	110.5	110.5
July	101.3	106.5	110.5	110.5	110.6	110.6
August	100.0	101.2	108.3	110.5	110.5	110.6
September	100.0	101.4	109.3	110.5	110.5	110.6
October	100.1	102.3	110.0	110.5	110.5	110.6
November	100.4	102.3	110.4	110.5	110.5	110.6
December	100.5	102.3	110.4	110.5	110.5	110.7
Yearly average	101.3	107.0	110.5	110.5	110.6	

### Index Numbers of Prices of Construction Machinery. For Selected Dates Between August 1939 and December 1944

(August 1939 = 100)

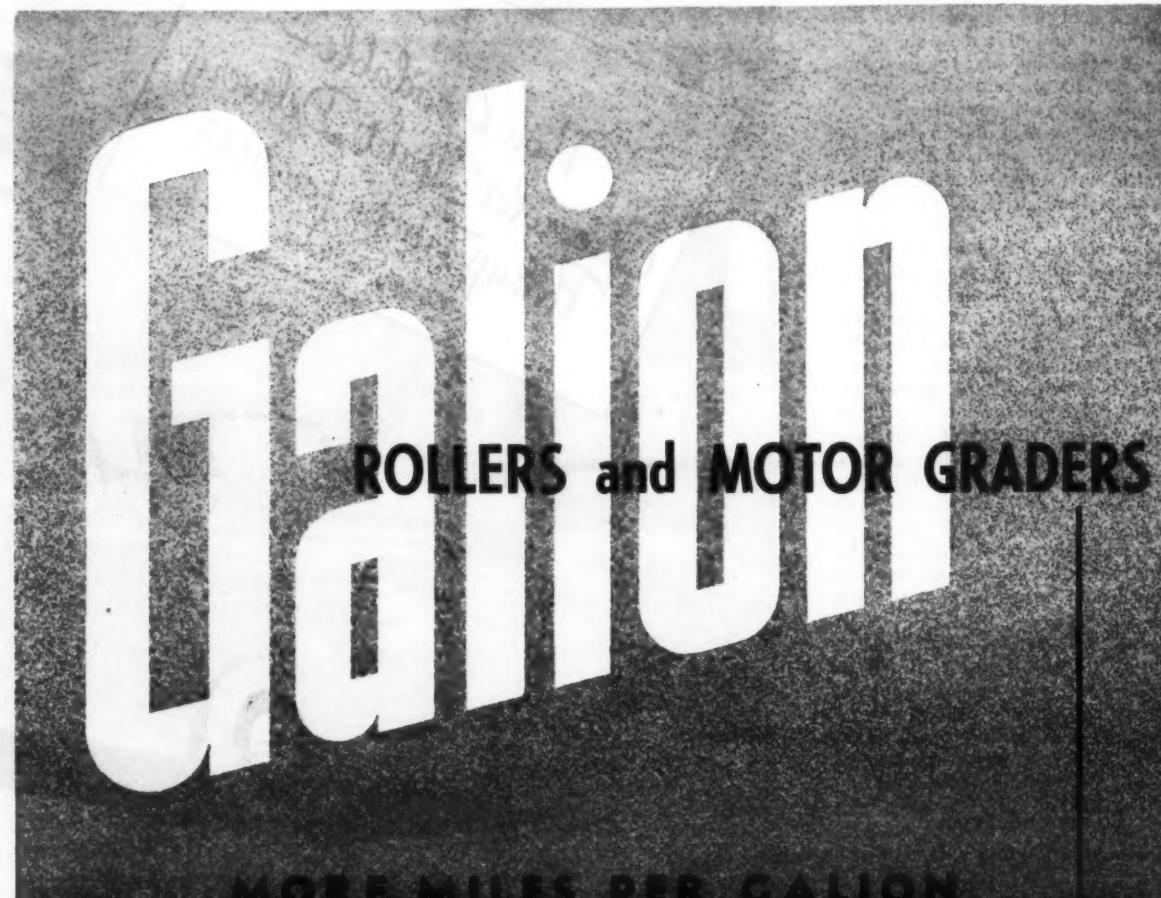
	Aug. 1939	Dec. 1940	Oct. 1941	Dec. 1942	Dec. 1943	Dec. 1944
Construction equipment, tractor-mounted	100.0	100.3	108.8	108.8	108.8	109.7
Construction machinery, specialized	100.0	101.1	110.8	111.5	111.8	111.8
Mixers, pavers, spreaders, and related equipment	100.0	100.5	106.3	106.4	106.3	106.8
Processing equipment	100.0	100.6	110.9	112.7	112.7	112.7
Cranes, draglines, shovels, and related equipment	100.0	101.4	110.5	110.9	110.9	110.9
Scrapers, maintainers, and graders	100.0	100.4	107.2	107.2	107.2	107.5
Drilling and boring machinery	100.0	100.0	100.0	100.0	100.0	100.0
Tractors, track-type	100.0	106.0	113.4	114.4	114.4	114.4
Portable air compressors	100.0	100.7	100.0	98.4	97.9	97.9
Construction machinery, all types	100.0	102.3	110.0	110.5	110.5	110.7

## County Gets Ready

(Continued from preceding page)

Engineer is on the Executive Board of the Minnesota County Highway Engineers Association.

Most of the Commissioners have held office for a number of years. Harvey P. Larson, District 1, has been a member continuously for 18 years. Dan A. Busch, District 2, has held this office for the past 24 years. Fred Carl, District 3, has been in the office for the past 10 years. Otto C. Perske, District 4, first served from 1917 to 1921, then was appointed in 1939 to complete the unexpired term of Henry Schraper, deceased. He was chosen again at the next election and has served since that time, making an approximate total of 9 years. Henry Schummer, District 5, has served continuously for 10 years. Mrs. Johanna C. Heisel, County Auditor, presides at the regular board meetings and has held this office for the past 11 years following the death of her husband who had held the office for 21 years.



MORE MILES PER GALLON

... is fast becoming a phrase which virtually speaks for the dependability and economy of Galion rollers and motor graders. ... Please inquire and send for the toughest kind of work in post and road construction (the war proved that), Galion should be your first choice on those roads and bridges to be built tomorrow. Remember Galion in your plans for the future.

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DISTRIBUTORS IN ALL MAJOR CITIES

## American Hoist & Derrick Names Two Distributors

Two exclusive distributors have been appointed by the American Hoist & Derrick Co., St. Paul, Minn., to handle American derricks, derrick fittings, and hoists, as follows: P. A. Neff Machinery, 1920 N. W. Miami Court, Miami 36, Fla., in the southern Florida territory; and Hall-Perry Machinery Co., P. O. Box

1367, Butte, Mont., to cover Montana and northern Wyoming.

### History of the Diesel

An attractive illustrated 32-page brochure has just been issued which tells the story of the diesel engine from the early days in Germany, when Dr. Rudolph Diesel's first experiment ended in an explosion that wrecked the machine,

down to the present important role of the diesel as a prime mover in construction, transportation, agriculture, and on the ships and tanks of our armed forces.

In concise simple terms, the book explains, with diagrams, just how the diesel operates, what it can do in numerous applications, and how it differs from other types of power. A chart shows the diesel industry's growth in horsepower output, from 2,000,000 hp in 1937 to

35,000,000 in 1944. Other sections deal with the post-war expansion of the diesel industry and the opportunities for employment it offers returning veterans.

Interested highway engineers and contractors can secure copies of this brochure "The Story of the Diesel" by writing on their official stationery to The Diesel Engine Manufacturers Assn., 1 No. La Salle St., Chicago 2, Ill. Just mention this review.

**HEIL HI-SPEED BOTTOM-DUMP WAGONS**

have the quality features that help you establish speed and production records

You can save time and make more money with this Heil Hi-Speed Wagon because it enables you to cut hauling costs . . . increase your yardage output . . . and reduce maintenance expense.

You save loading time because the big capacity cuts spotting delays; the big open top speeds the loading cycle. You can travel up to 27 m.p.h. to the fill — where power-operated doors on the clamshell principle give full opening and pull up entirely out of the way.

Simple, rugged, Heil quality construction takes the punishment of rough, fast hauling and dumping with minimum maintenance delays. There are no dragging doors to cause trouble.

We list here a dozen reasons why famous Heil Hi-Speed Wagons "pay off" in service and satisfaction — there are dozens more. Write for bulletin giving full details of Heil's advanced design or —

*See Your INTERNATIONAL TRACTOR DISTRIBUTOR*



Heil Hi-Speed Cable Scrapers carry a heaped 15-yard load.



Heil Cable-operated bulldozers speed dirt-moving jobs.

R-48

THE HEIL CO.

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## MVA Is Unnecessary, Would Delay Action

The tide of public opinion is rising to unusual heights against the proposed Missouri Valley Authority. Prominent engineering authorities in St. Louis and elsewhere have already appeared before a subcommittee of the Senate Committee on Commerce to speak against the plan. Representatives of the Associated General Contractors of America, appearing before the same committee, pointed out that ample provision has already been made by Congress for the development of the Missouri River Basin. Calling attention to the fact that a unified plan for development of the Missouri Valley has been agreed upon by the U. S. Corps of Engineers and the Bureau of Reclamation and has been approved by Congress, H. E. Foreman, Managing Director of the AGC, declared, "Our association can see no need for the enactment of this legislation which would establish a Missouri Valley Authority to unify a plan that has already been unified."

"There is not only no need for the establishment of a Missouri Valley Authority," he continued, "but the establishment of a Missouri Valley Authority would delay flood-control and conservation work already planned for that area." He further contended that the Valley Authority plan is contrary to the American system of free private enterprise.

F. W. Parrott, Vice President of the C. F. Lytle Co., Sioux City, Iowa, appearing as Chairman of the AGC Legislative Committee, told the Senate Committee that he opposed the legislation on two fundamental principles:

"(1) That construction of public works should be done by letting contracts to responsible contractors after public bids, and (2) that such a method of constructing public works can best be carried out by existing Government agencies. It is suggested that if a special Valley Authority is established in the Missouri River Basin, the work can be done by contract, but this bill does not so provide and if it did, it could easily

be amended. One must depend for matters of policy upon the past performance of the agency in charge. The U. S. Corps of Engineers and the Bureau of Reclamation have a definitely established policy for doing work by the contract method. The Tennessee Valley Authority, which serves as a basis for this legislation, did all of its construction by

day labor and an analysis of its construction costs has never been available to the public."

*Lubricant in a piece of equipment is really a structural part of the mechanism. To use the wrong oil is just about as bad as putting in a repair part which doesn't fit.*

## 2 POWERFUL MODELS

Available for 110-volt  
A.C. or D.C.; 220-volt  
A.C. or D.C.

MODEL 120—  
12" blade, 4½" cutting capacity.

MODEL 80—  
8" blade, 2½" cutting capacity.

## ADD EASE SPEED and PRECISION to HEAVY SAWING

WITH A

*MallSaw*

MODEL 120



- ★ This powerful 12" MallSaw is built for extensive sawing of heavy lumber and timber. Also cuts non-ferrous metal, cuts and scores concrete, tile and stone with an abrasive wheel. High speed, heavy duty motor withstands hard, continuous usage—has power to spare. Easily adjusted for depth or bevel cuts.
- ★ Extra speed reduces sawing time—accurate cuts assure square board ends and better fitting. Multiple cuts of like members speed construction.
- ★ Light in weight and perfectly balanced for easy handling. Takes waste motion, fatigue and backaches out of heavy cutting jobs.

Ask your distributor or write for literature and prices

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PORTABLE  
POWER TOOLS

## SURFACE CONSOLIDATION *Cuts* ROAD MAINTENANCE COSTS

STATE ROAD #5 ... 9 MILES		TRAFFIC 200 PER DAY
1939 Blading Cost Before Calcium Chloride	\$1,183.75	vs
1943 Blading Cost After Calcium Chloride	\$457.95	

J. S. Schmit, Engineer of Stearns County, Minnesota tells in "Roads & Streets" how surface consolidation with calcium chloride reduced maintenance costs and improved more roads.

Briefly, at the start the blading cost was \$32,598.76 for 750 miles. Three years later, with surface consolidation and calcium chloride 813 miles were bladed for \$28,391.64 — 63 miles more road maintained for \$4,207.12 less although blading crew hourly rates increased 25c per hour.

The great value in Mr. Schmit's work beyond the remarkable savings was the extended mileage of improved traffic service, which can be duplicated in your own community.

Write for literature on Surface Consolidation and Maintenance. Ask for Bulletin No. 29 which gives facts, figures and methods.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Building, Detroit 26, Mich.

Don't let the cement in your gravel road

Save it with

**CALCIUM CHLORIDE**



## Maintenance Methods For Army Pavements

(Continued from page 21)

aggregate trucks when traveling to and from the quarry. Loose material on the surface was thoroughly bladed and kept damp until maximum compaction and consolidation had taken place. Corrugations were removed and repairs made by wetting, blading, adding material when necessary, and rolling. Dust and wear by tank treads on this pavement are not a serious problem. The success of this type of pavement is believed to be due to a combination of factors such as excellent surface and subgrade drainage, the right combination of hard limestone and soft cementing limestone, and a comparatively damp climate.

From experience gained at a number of armored-division posts, the following conclusions may be drawn with respect to the use of bituminous pavements for tank traffic:

(1) While cold-mix or low-type hot-mix bituminous concrete is not suitable for steel-tread tank traffic, the use of a high-type hot-mix hot-laid bituminous-concrete pavement, usually using not less than 6½ per cent of 35 to 100-penetration asphalt, with the percentage of aggregate passing the 200-mesh sieve on the high side, has given satisfactory results along the California coast.

(2) A flexible base, such as slurry or waterbound macadam, is to be preferred to rigid bases, in order to avoid possible joint deterioration.

(3) A bituminous wearing-course thickness in excess of 3 inches is not economically justified, since additional wearing courses can be added periodically as surface wear progresses.

(4) The maximum size of aggregates in the wearing course should not exceed ¼-inch, with ½-inch preferred.

(5) The use of a periodic seal to protect the wearing surface and to prevent pitting is good economy.

(6) Maintenance costs on all types of tank road pavement will always be much higher than on highway pavements.

(7) The perfect road has yet to be developed for steel-cleated tank traffic.

### Numbering and Marking Pavements

Standard practices used by highway departments in numbering and marking pavements are followed, except that glass beads are always prescribed on airfield pavements. Reflective delineators are used to outline taxiways.

### Snow and Ice Removal

The use of calcium chloride to remove snow and ice from airfield pavements is not general because of the requirement of the using service that planes be washed after traveling on surfaces treated with calcium chloride, and because it is necessary to use it in a solution to which must be added corrosion inhibitors, such as sodium bichromate. Such solutions, to be effective, should have a pH of 7, i.e. be neutral from an acid or base standpoint.

The use of rock salt at the rate of ¼ pound per square yard of pavement to be treated on other than airfield pavements is encouraged. Salt, if applied before 2 inches of snow has fallen, will retard or prevent the formation of ice by keeping the snow in a mealy condition until it can be removed. The use of salt is most effective at temperatures above 15 degrees F.

The clearing of snow from runways is a formidable job unless posts are properly equipped for this work. On runways 500 feet wide it can readily be seen that the snow in the center of the runway must be bladed a distance of 250 feet to the runway edge. Fast blade plows, used in conjunction with the large-size blower and wing-type rotary

snow plows, have proved most satisfactory to the using service by clearing the runways in a minimum of time.

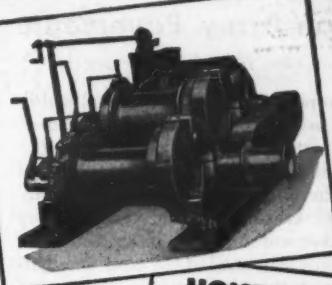
### Drainage

Experiments now under way by the Chief of Engineers at the Flexible Pavement Laboratory at Vicksburg, Miss., have demonstrated the absolute necessity for keeping pavement surfaces and joints tight, in order that a continuing or intermittent supply of water does not reach the base courses and subgrades. Such water, when it increases the water content of the subgrade above optimum for the load applied, markedly decreases the supporting power of the subgrade and eventual pavement displacement and failure result. This is especially true in silts, sand-clays, and sand-gravel-clays. The heavy clays and free-draining sands and gravels are not as critical in this respect. This effect is more marked when pavement loadings exceed designed loads to the point where consolidation takes place. In this case, the subgrade

(Concluded on next page)

## Hoists to Fit the Job

Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency on the job. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire first of LIDGERWOOD.



**HOISTS FOR:**  
CABLEWAYS  
INDUSTRIAL PLANTS  
CONTRACTORS  
MINES—DOCKS  
RAILWAYS

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Manufacturing Company

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ARMED FORCES MATERIAL HANDLING EQUIPMENT

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- 2nd award... June 26, 1944
- 3rd award... July 28, 1944
- 4th award... Feb. 17, 1945

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**ALL PURPOSE**

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• PULLSHOVEL  
• DRAGLINE  
• CLAMSHELL

WE BUILD A WIDER AND MORE COMPLETE LINE OF MATERIAL HANDLING BUCKETS THAN ANY OTHER MANUFACTURER.

WE ARE THE WORLD'S LARGEST BUILDER OF WELDED SHOVEL DIPPERS—sizes ½ yd. to 18 yds. In certain sizes our volume exceeds that of all other manufacturers combined.

EXPERIENCE COUNTS

**Pettibone Mulliken Corp.**

"Quality Since 1880"

4700 WEST DIVISION STREET, CHICAGO 51, ILLINOIS



## Maintenance Methods For Army Pavements

(Continued from preceding page)

may lose part or all of its original stability due to the so-called "pore-pressure" or "hydrostatic-excess-pressure" effect.

In addition to "keeping the roof tight", the maintenance of proper drainage, and keeping surface water away from pavement surfaces, bases, and subgrades are essential. One and one-half per cent transverse surface slopes are considered the minimum requirement to provide proper surface drainage. In this connection, the pavement-maintenance engineer must use care to see that his repairs do not add to his drainage problems at some future date.

### Pavement Cleanliness

Emphasis on keeping paved surfaces free from loose abrasive materials has paid big dividends in lessened pavement, tire, engine, and propeller wear and damage. The use of traveling magnets

at newly constructed stations, and especially at depots, to pick up nails and other tramp iron, has also proved of great value to both the preventive maintenance program, and to the program for the conservation of tires. At one station, approximately 3,000 pounds of tramp iron was picked up by traveling magnets during the first general clean-up following construction at the camp. Sufficient power should be used so that the nails will be picked up and not just moved in the road aggregate so that the points of the nails are pointed towards the pavement surface.

### Conclusion

In conclusion, I wish to emphasize that the opinions expressed here are personal and are entirely unofficial. It is hoped, however, that this recital of experience and opinion may be stimulating to further thought on the problems of maintenance and repair of both military and non-military pavements.

From a paper presented at the University of Utah Road School, March, 1945.

# PARSONS 250 TRENCHLINER



### BOOM EASIER TO SHIFT FROM SIDE TO SIDE

*... because it rides on rollers*

Shifting the boom for trenching in close quarters, for digging close to trees, poles or curbing lines, in narrow alleys or on road shoulders, costs less with the Parsons 250 Trenchliner because the 250 boom is easy to shift. Riding on two wide rollers, the boom rolls smoothly and easily from side to side across the full width of the boom carriage when anchor bolts are removed. Parsons trenchers alone have these patented transverse boom shifting rollers.

Wide rollers support the telescoping boom, make it easier to shift from side to side.

**THE PARSONS COMPANY**  
KOEHRING SUBSIDIARY NEWTON, IOWA  
TRENCHING EQUIPMENT



## Road-Broom Catalog

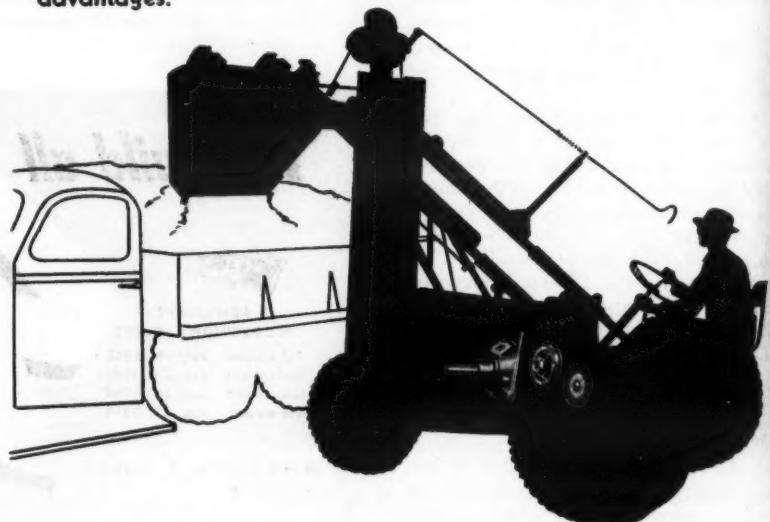
The Littleford line of road brooms featuring a hydraulic-lift arrangement for raising and lowering the brush, which can be quickly adjusted to sweep either forward or backward, is described and illustrated in a 6-page folder just received from Littleford Bros., Inc., 485 E. Pearl St., Cincinnati 2, Ohio. The

traction-driven Model 106 and the power-driven Model 108 are shown with various attachments, including a sprinkler which can operate with or without the broom as desired, and a blower attachment for dispersing dust as the sweeper operates.

Copies of Bulletin U-19 will be supplied upon request to the manufacturer and mention of this magazine.

## V V To Make Sure That Your CLUTCH Application Is RIGHT

Before you approve the blueprint for your post-war model — double check to see if it includes all the improvements you can give your product with the right ROCKFORD CLUTCH application. You are invited to utilize the clutch "know how" of our engineers to give your design the technical advances that will provide you and your customers with important advantages.



### SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.



**ROCKFORD CLUTCH [FORMERLY KNOWN AS DRILLING MACHINE] DIVISION** BORG-WARNER CORPORATION

314 Catherine Street, Rockford, Illinois, U.S.A.



**ROCKFORD**  
CLUTCHES

## PRODUCTIMETER HOUR METERS

give actual running hours  
of gas or Diesel engines

Hour Meters, for direct application on different makes of engines, register hours of operation . . . obtained through the conversion of an average crankshaft speed into hours of running time. Readings thus obtained are invaluable to owners and operators of motorized construction equipment, and provide a basis for highest efficiency maintenance and service records. Use them on compressors, mixers, graders, tractors, bulldozers, crushers, pavers, road rollers.



Compact . . . easily adaptable . . .  
send for complete details in  
Catalog No. 20

**Model HM - 7418**  
For distributor equipped engines  
with SAE type A or B distributor  
mounting.

**DURANT MANUFACTURING COMPANY**  
1976 N. Buffum St. • Milwaukee 1, Wis.

# Proper Care Scores, Biggest Safety Aid

## Job Accident Prevention Starts With Maintenance Of Machines; Safety Is Good Business

By JOE EASTER, Superintendent, Braden Construction Co., Hastings, Nebraska

IN fourteen years we've never had a serious accident to a workman or a piece of equipment. Thus far only two reports show lost man-hours from accidents and both these were arm injuries. The biggest factor behind this record of safety is our emphasis on maintenance.

Most of our equipment rebuilding is done during the winter months when bad weather makes outside construction work impractical. The machine operators come to the shop and help on the job. Before the work is finally passed by the shop foreman, it must have the O.K. of its operator. This is important. Confidence on the part of the operator spells SAFETY. When an operator is using a machine which he fears may break down at any moment, or on which the worn cables may snap, the operator's lack of confidence makes that unit a hazard to the whole job.

### Equipment, Inspection, and Repairs

The major equipment of the Braden Construction Co., assigned to the group working on the Hastings Naval Ammunition Depot, Hastings, Nebr., included the following:

- 10 De tractors with scrapers
- 3 Auto Patrols
- 2 Farmall tractors
- 1 Dragline with  $\frac{3}{4}$ -yard bucket
- 1 Large semi-trailer with truck
- 3 Sheepfoot rollers
- 1 Mobile welding unit
- 1 Portable light plant
- 3 Pick-up trucks

At our headquarters in Hastings we have a maintenance and repair shop of approximately 5,000 square feet of floor space. The shop is manned by a crew of trained mechanics and welders. We have a specialist who looks after wire rope because we use a considerable quantity of rope in all our operations. On each job of any size, we always have two or three greasers assigned to keeping equipment properly lubricated.

If most of our equipment is at one location, we station our mobile welding truck there. If we have several small jobs, the welding truck is headquartered at the maintenance repair shop and kept on call day and night.

### Watching Wire Rope

On-the-job wire-rope inspections are usually the direct responsibility of our rope man. Proper wire-rope maintenance brings results in both safety and longer life for the rope. But ropes do wear out, and the superintendent who tries to get the last day's work out of a rope seldom has a good safety record.

When working in frozen earth, we have found that cables should be retired from the machines much sooner than during the summer months. Often ropes which have been retired in winter can be cleaned, repaired, and used safely on similar jobs during the summer. We have found that there is more chance for an accident in our type of work during the very cold months. Therefore, we take special safety precautions in winter. This extends to the employment of new operators as well as equipment.

Our rope maintenance program is a simple one. We use mostly preformed cable as we have found that it responds to service more readily and gives the machine operator that added confidence which is needed for a no-accident record. Reserve cables are kept in a separate storage room. Used ropes, before going into storage, are cleaned, inspected, serviced, and given a storage lubrication.

The latter consists of treating the rope with a protective dressing. We use only recommended lubricants.

Both preformed and non-preformed ropes are seized on the cut ends after servicing. This is not an absolute requirement for preformed ropes but we do it anyway just to make certain that the ends are held absolutely tight for sockets or other fittings. With non-preformed, the open end must be seized or the rope will ruin itself by flying apart.

On the job, cables are regularly inspected by both the machine operator and our wire-rope man. Rope repair, including refittings, is usually done by the mechanic assigned to the project. We do not clean ropes on the job before inspections unless the type of work or working conditions demand it. Lubrica-



The Braden Construction Co. uses this mobile welding unit, consisting of a Hobart electric welder and an acetylene cutting and welding outfit, to maintain its equipment.

tion of the rope on the machine is done by the operator or by the greaser assigned to the unit.

### Carelessness Is Out

No foreman or superintendent should take a chance with a careless machine operator. During the past two years,

however, all of us have had to take some chances and it looks as if the same labor-shortage conditions would prevail for the rest of this year at least.

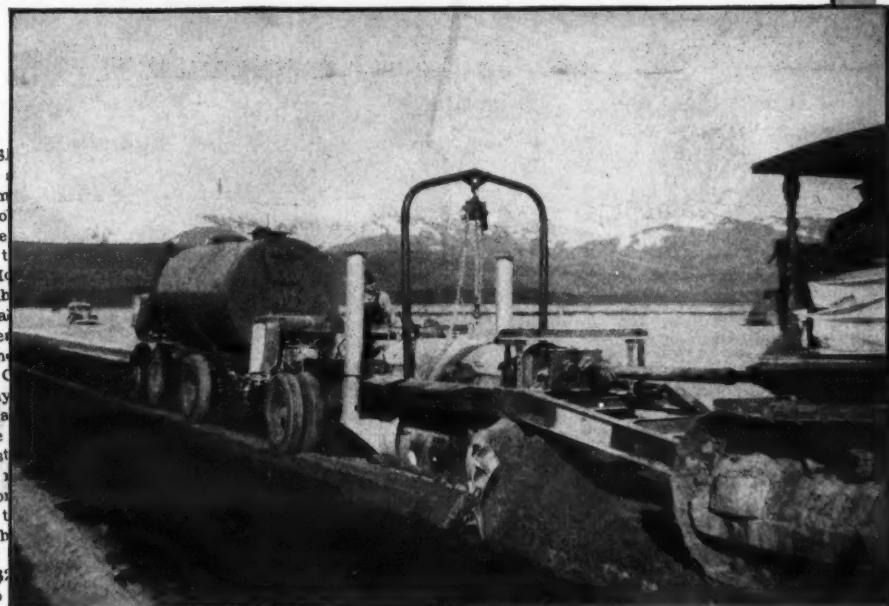
Today our overall maintenance program is one of necessity. We cannot readily buy new replacements. But I think our experience of the past few years has taught us that more attention to proper maintenance means fewer accidents and consequently pays cash dividends. I doubt if our stepped-up maintenance program will ever be relaxed, because it will always be good business.

## Floyd Made President Of Duff-Norton Mfg. Co.

Walter I. Floyd, formerly Executive Vice President, was recently elected President of the Duff-Norton Mfg. Co., Pittsburgh, Pa., maker of lifting jacks for every purpose. Mr. Floyd succeeds Robert G. Allen, former President of the company, who has resigned. E. M. Webb was named Vice President and General Manager.

## How Rains, Cold Weather, Poor Soil Conditions Were Licked at Gustavus

*Grading, draining and paving methods which successfully solved unusually tough problems encountered in building an isolated airport in Alaska's rain belt*



## WOOD ROADMIXERS Help Whip Tough Airport Job

Gustavus Airport located 50 miles west of Juneau in southeastern Alaska was built for the Civil Aeronautics Administration and is being used by the Army Air Force.

The fact that 2 Wood Roadmixers were used on this job is proof of the ability of this pioneer traveling mixing plant to handle any paving job—anywhere.

The story of how American engineering skill and equipment whipped this tough assignment at Gustavus has been factually recorded by a CAA official. The story is complete with data and pictures and should be of unusual interest to every designer, engineer and contractor. We will be glad to send you as many copies as you wish. Write today.

WOOD MANUFACTURING CO.

816 WEST FIFTH ST.

LOS ANGELES 13, CALIF.

### Post-War Public Works For French West Indies

A public-works program, to be financed by a proposed loan of 200,000,000 francs, (approximately \$4,000,000) is under consideration for Martinique, French West Indies. This program would include port works at Fort-de-France, at a cost of about \$1,000,000; improvements to highways, \$700,000; and \$100,000 for the start of construction of an airfield.

An airfield is planned at Gripon, about 10 miles northeast of Pointe-a-Pitre on Grande Terre, the eastern island of Guadeloupe, F.W.I. The plans call

for two reinforced-concrete runways, between 4,900 and 6,500 feet long, and two metal hangars, each with a covered area of about 32,000 square feet. According to the Guadeloupe press, there will also be an administration building to accommodate the customs office, a restaurant, sleeping quarters, and weather station.

### Graham-Paige Motors Co. Names Sales Personnel

E. Peerce Lake has been appointed General Sales Manager of the Graham-Paige Motors Corp., Detroit, Mich. Since last November Mr. Lake has been Vice

President and General Manager of the Warren City Mfg. Co., Warren, Ohio, a Graham-Paige subsidiary, and previous to that time had served in the same capacity with the Columbia Machinery & Engineering Corp., Hamilton, Ohio. Mr. Lake has a background of eighteen years of sales, promotion and public relations activity with General Motors, and was given a wartime leave of absence by that company to accept the Columbia appointment.

Glen L. Logan, formerly connected with the Packard Motor Car Co., and a member of the Graham-Paige staff since 1943, has been named Assistant Sales Manager.

### Tractor Sidebooms

#### And Backfiller Units

Cardwell sidebooms, operated by the power take-off of the Caterpillar tractor on which they are mounted, are used for laying pipe in trenches and for other similar mobile crane operations. These sidebooms are made by The Superior Equipment Co., Box 30, Bucyrus, Ohio, manufacturer also of backfiller and ditch surfacing units of the bucket and blade types.

All three of these units are illustrated and described in detail in Form No. 370 which may be secured direct from the manufacturer by mentioning this item.



**O**n those big jobs where tonnage of aggregates runs into the hundreds of thousands, the difference of a few cents per ton in production cost may mean profit or loss to the contractor. That's where the big Cedarapids Unitized Plant with its high capacity and low operating costs pay big dividends.

This super crushing plant handles material in a continuous flow from quarried rock to delivery trucks at the rate of 150 to 200 tons per hour. The big primary with its 1000 sq. in. jaw opening sets the pace for the entire plant taking the biggest rock with ease. A smaller jaw crusher and roll crusher in the secondary unit then reduce the oversize to the wide range of sizes to meet all aggregate specifications. Each unit is mounted on a pneumatic-tired truck ready to attach to a truck-tractor. Costly dismantling and erecting time have been eliminated so idle time is kept to the minimum.

Get ready for those BIG postwar jobs now. With a Cedarapids Unitized Plant to produce the aggregate at lowest cost you'll be sure of getting your share.

**IOWA MANUFACTURING CO.**  
Cedar Rapids, Iowa

#### THE IOWA LINE of Material Handling Equipment Includes

- ROCK AND GRAVEL CRUSHERS
- BELT CONVEYORS
- STEEL BINS
- BUCKET ELEVATORS
- VIBRATOR AND REVOLVING SCREENS
- Straight Line Rock and Gravel Plants
- FEEDERS—TRAPS
- PORTABLE POWER, CONVEYORS
- PORTABLE STONE PLANTS
- PORTABLE GRAVEL PLANTS
- REDUCTION CRUSHERS
- BATCH TYPE ASPHALT PLANTS

- TRAVELING (ROAD MIX) PLANTS
- DRAG SCRAPER TANKS
- WASHING PLANTS
- TRACTOR-CRUSHER PLANTS
- STEEL TRUCKS AND TRAILERS
- KUBIT IMPACT BREAKERS

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# County Highway Dept. Well Organized Unit

(Continued from page 2)

low No. 4 priority, which is just one step ahead of beer trucks.

Last year's county and township-road maintenance program included 30 miles of resurfacing and 100 miles of seal-coat application on bituminous roads. In 1943, the disbursement for the maintenance of township and county roads was \$263,310; in 1944 the sum was \$294,812.

## Gravel Pits

The County owns fifteen gravel pits and leases thirty others distributed about the county so that long hauls will be unnecessary. A county-owned Pioneer Duplex 38V crusher with a capacity of 70 to 100 cubic yards per hour is moved from pit to pit processing gravel for the stockpiles which are essential in the maintenance of gravel and black-top roads. All material is crushed to pass a  $\frac{1}{4}$ -inch screen, and everything that passes the  $\frac{1}{4}$ -inch screen on the crusher is classified as sand. This sand is also stockpiled, for winter maintenance. Three Barber-Greene loaders are available for use in these pits along with a Bay City  $\frac{3}{4}$ -yard shovel, a Link-Belt Speeder  $\frac{1}{2}$ -yard shovel, and a Michigan truck shovel.

Two pits which are producing excellent material for this gravel-surface program are the Whitman pit, 5 miles southeast of Lansing, from which 20,000 cubic yards have already been taken, and the Dart pit, a mile north of Mason, which the County bought four years ago for \$20,000 and which has already yielded 150,000 cubic yards of gravel.

## Snow Removal

Not the least of Ingham County's maintenance problems is snow removal. The County owns forty-eight trucks of various makes and sizes, all of which are equipped with a universal A-frame which enables them to carry any type of plow. The usual procedure is to send out the trucks when the snow reaches a depth of 1 inch, and to float the snow off to the side of the road by using underbody blades. This side windrow of snow is then thrown off into the ditch by heavier blade plows. For heavy falls, best clearing results have been obtained by the use of a heavy-duty Duplex 5-ton truck carrying a V-plow and pushed by another 5-ton truck.

According to contract, the state trunk-line highways are cleared first, after which the county roads are plowed. When the snow is removed from concrete roads, a mixture of calcium chloride and sand is then used to melt the ice. This may be spread by a mechanical sander or thrown on with hand shovels from a truck. Chloride alone is never applied to concrete, but on bituminous surfaces salt is applied directly. Within four hours of the start of operations, the state highways are usually bare. While the county roads are always cleared of snow, they are not cleaned bare as are the trunk lines.

As the road crews are often out 48 hours at a stretch, they are required to keep in communication with the office by telephoning every 1½ hours to make known their location so they may be shifted around as weather or other conditions warrant, or sent to help another crew that may be in distress. One of the minor irritations to the County Engineer during big storms is the complaints from people who feel that the particular piece of county road on which they live should be cleared first in preference to the main highways. A favorite ruse is for a man to call in and say his road must be cleared at once as his wife is sick and needs a doctor. The complainant generally backs down, however, when he is



Over 150,000 yards of gravel have been taken from Dart pit owned by Ingham County, Mich., where this Barber-Greene loader is operating.

told that, if it is an emergency, the road crew will go and get the doctor and bring him in on a plow.

During a heavy storm late at night a

doctor was hurrying to a sick call and got snowed under in his car. He was rescued by the crew of a V-plow and taken to his destination, an isolated

farmhouse in the Township of Delhi, where he was forced to perform an emergency appendectomy with the patient lying on the kitchen table while the snow-plow crew heated the water and held the kerosene lamps for the operation.

## Central Garage

The central county garage is located on the west side of U. S. 127 in Mason at about the center of Ingham County. The red brick building has a frontage of 80 feet on the road and a depth of 121 feet. In the front of the building on the ground floor is the County Engineer's office, in back of which is the office of Superintendent of Equipment. North of these offices and entered through overhead doors is the three-car garage for the Commissioners' cars. Occupying the second floor in the front of the building are the Commissioners' room, a clerical office, and the drafting room equipped with a Wickes Simplex Printer for blueprints, and a photographic dark room.

(Concluded on next page)



"Spray Master" spraying a city street with the Vacuum Flow Full Circulating Spray Bar set at a desired width.\*

The "Spray Master" Pressure Distributor will apply Asphalt, Tar, Cut-Back, Road Oil or Emulsions hot or cold with the same efficiency.

### WHEN HEATING THE MATERIALS THE BURNER OPERATES ON LOW COST FUEL OIL

If Hot Materials are to be used the "Spray Master" heats the Bitumen by means of one of the famous Atomizing Low Pressure Burner that operates on fuel oil and produces more heat than the conventional type of burner. Only one Burner operating plus the burning of Low Cost Fuel Oil adds up to a saving in the production of hot materials.

### HEATING SYSTEM IS THE FASTEST AND SAFEST

In addition to the low cost of fast heat producing Atomizing Low Pressure Burner the Continuous Heat Flue System developed by Littleford forces the heat through seven complete passes through the tank. This eliminates hot spots and gives uniform heat throughout the tank.

### MODERN ROAD BUILDING NEEDS MODERN EQUIPMENT

Littleford "Spray Master" Pressure Distributors are designed to function with speed and accuracy. Here is the modern Unit for Building and Maintaining our present and future Roads, Streets, Highways and Airport Runways.



**LITTLEFORD**

485 E. Pearl St.

LITTLEFORD BROS., Inc.  
Cincinnati 2, Ohio

## County Highway Dept. Well Organized Unit

(Continued from preceding page)

The garage proper, 80 x 81 feet, is entered through a 15-foot electrically operated overhead door at the south end of the east wall. This room, used for truck repair and storage, has a concrete floor with drains, steel trusses supporting a wooden roof covered with built-up felt, and is well illuminated by eighteen fluorescent dual light tubes, each of 100-watt capacity, hanging from the roof trusses. Two exhaust fans placed at floor level in the north and south walls near the west end draw out the noxious garage fumes. A mechanics' work bench is located in the northwest corner where are also stationed a Kleer-Flo unit for cleaning machinery parts, and a Meco acetylene welding outfit. The garage is adequately protected by fire extinguishers. Steam heat for the side-wall radiators comes from a steam boiler located in the basement to which coal is fed by a stoker. An auxiliary boiler supplies hot water for the shower and wash room which is also located in the basement.

### Machine Shop

An 18-foot opening in the west wall of the main garage leads into an 80 x 40-foot room where heavy equipment is repaired. In the center of this room is a Weaver twin-post mechanical lift for trucks, operated by an Allis-Chalmers engine, while in the southwest corner is a Weaver No. 2 power washer. Circling the ceiling is a monorail carrying a 5-ton crane which is augmented by a Weaver 1-ton portable hoist mounted on steel casters used for lifting engines from trucks. Machinists' benches are placed along the west wall and are equipped with small tools, bench vises, air and electric outlets. In the northeast corner is a 12 x 20-foot wire-mesh enclosure where chains are stored and oil dispensed.

The machine shop occupies an area 28 x 30 feet in the northwest corner of the room and is lighted by nine fluorescent tubes. Located overhead on a mezzanine platform are a Globe air compressor, and an electric motor which operates a line shaft furnishing motive power for such machine-shop equipment as a Canedy-Otto radial drill, a U. S. electric drill, a 16-inch x 5-foot Mueller

lathe, and a milling machine. Equipment with self-contained power units includes a 10-inch x 42-inch Craftsman lathe, a power hack saw, a Weaver 60-ton press used on bushings, a Manley brake-relining machine, a bench grinder, a scythe grinder for mowing machines, and a Williams, White & Co. trip hammer. Batteries are checked on a John Bean B. & R. battery breakdown tester and are charged on a Kathanode battery charger. Tires are removed from rims, and casings spread by a Weaver tire machine. Welding is done both by a Prest-O-Lite acetylene welder and a 220-volt 50 to 300-ampere electric welder. A 40 x 40-inch blacksmith's forge with an electric blower and a 200-pound anvil complete the equipment. Exit is through a 15-foot overhead door in the south wall. The eight men now employed in the garage are under the supervision of Clarence Adlof, Superintendent of Equipment.

### Storage and Signs

To the rear of the garage is a 34 x 80-

foot two-story building of brick construction and concrete floor, the first floor of which is divided between a stock room and a carpenter shop. Road and park signs are cut out on a 12-inch Crescent saw and sent upstairs to be painted. A pleasing rustic effect for the park signs is obtained by covering the wood frame with an asbestos paper template in which the symbol or message has been cut, then passing a blow torch over the surface, after which it is varnished. Ten men are used here to keep the county roads and the nine county parks well marked with directional and other signs.

Equipment and material are stored in a 5-acre yard in the rear where a 20 x 220-foot shed houses cement, salt, and calcium chloride. Gasoline is stored in a 10,000-gallon tank, 10 feet in diameter x 23 feet 6 inches long, while there are two smaller 500-gallon tanks for fuel oil and kerosene. A Reo truck with an 800-gallon gasoline tank visits the various jobs and keeps the equipment supplied with fuel.

Besides the trucks and other equipment previously mentioned, Ingalls County maintains and operates a Barber-Greene bituminous spreader, a Pioneer portable bituminous mixing plant, two Adams and one Austin-Western 99 power grader, an Austin-Western power sweeper, an Austin-Western 5-yard scraper, a Barber-Greene 44C dumper, two 1,000-gallon South Bend bituminous distributors, two Buckeye chip spreaders, International diesel tractor, a Caterpillar Twenty and a Caterpillar Thirty-Five tractor, besides the usual mowers, sand spreaders, and other light equipment.

## Pittsburgh Plate Glass Names General Export Mgr.

J. H. Henshaw has been named General Export Manager of the Pittsburgh Plate Glass Co., Pittsburgh, Pa., manufacturer of structural glass, metal-protecting paints, and similar products. He has been with the organization since 1931, and most recently served as Assistant Manager of the Boston unit.

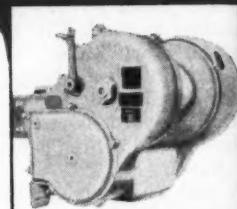
## Quiet Operation is Smooth POWER at Work... Isaacson WINCHOISTS are QUIET

Quiet power . . . great power . . . are instantly apparent when you see the NEW, improved Isaacson WINCHOIST for International in action.

Operation is QUIET because spiral gears provide a maximum amount of teeth in mesh at one time . . . evenly distributed pressure and indirect contact lines . . . highly accurate, sturdy, precision-built mechanism. Great POWER means handling of large loads. Quicker hookup is possible. 50% faster reverse action allows unspooling at just the right speed for a man walking with cable end. Better balance due to closer mounting of winch to tractor, distributes load, properly saving equipment.

There is only one adjustment—the easily accessible brake takeup. All moving parts are enclosed yet easy to get at. Finger tip control brake, self-energizing on either over or under wind. Oversized bearings, shafts and gears.

**AVAILABLE NOW . . .** See your International dealer for further details or write us direct.



This guaranteed  
operating  
reliability  
is unique  
in WINCHOISTS

**Shunk**  
Superior Quality  
BLADES  
AND CUTTING EDGES

For any make of machine  
Motor Graders, Main-  
tenance Scrapers, Trail-  
ers, Bulldozers, Backfillers,  
Wagons, Scrappers, Trail-  
Builders, Trail Blowers,  
Carryalls. Also—

CUTTING EDGES  
WEARING BOOTS  
EXTENSION BLADES  
MOLDOARDS  
and  
SCRAPER TEETH

30 years of manufacturing blades has developed for you the greatest quality, through our own rolls and forged at the edges to give that extra wearing quality you need.

All widths, lengths, and  
thicknesses, **READY TO USE** machine.

Consult your Internationally recognized Blade Speci-  
alist. Write for his bulletin, giving type and  
name of machines you operate—get set for blades  
QUIET.

**Shunk**  
MANUFACTURING  
COMPANY  
Established 1886  
BUCKYUS, OHIO

# ISAACSON

A PRODUCT OF THE ISAACSON IRON WORKS • SEATTLE



This fine grove of birch trees will be a permanent roadside asset through its acquisition by the Town of Shelburne, N. H., as a tribute to its citizens in service.

### Shelburne's Memorial Roadside of Birches

The famous Birch Road in the Town of Shelburne, N. H., is the site of the new Shelburne Memorial Forest dedicated in September, 1943, to townsmen serving in the armed forces of the United States. The larger part of the area, on one side of the highway, was acquired in 1943 and comprises about 20 acres. Later on a strip of land 100 feet wide on the other side of the road was acquired by deed of gift.

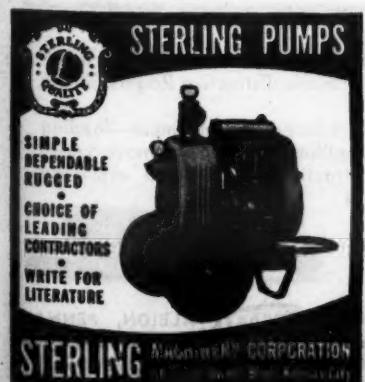
It is the hope of the Town to acquire other roadside strips throughout the locality which is noted for its birch-tree-lined roads. According to Lawrence E. Philbrook, Chairman, Board of Selectmen of Shelburne, the original thought was that, by acquiring these lands, the Town would preserve the beautiful roadsides and establish a living tribute to service men and women, one which would be lasting and beautiful. In later years, too, there is a possible source of income to the Town through selective cutting of such trees as can be sold commercially.

At the present time, simple wooden markers have been set at each end of the tract. About midway of the area and on the roadside is a small cleared area where there is a flagpole and a temporary honor roll. After the war, the honor roll and roadside markers will be replaced by simple permanent memorials which will tell the story but be in keeping with the woodland surroundings.

A picnic area is a possibility, but at present there is divided opinion regarding its advisability. Chairman Philbrook writes, "There certainly seems to be a decided interest in war memorials and personally I think parks, playgrounds, roadside areas, etc., are very logical".

### Light Steel Towers For Floodlighting

A new radio or structural tower which can also be used for supporting floodlights has been announced by Harco Steel Construction Co., Inc., 1180 East Broad St., Elizabeth 4, N. J. The light weight of the individual parts and simplification of the design make this Harco Blizzard King tower very easy to erect. The average weight of members is 5.3



pounds while the heaviest tips the scales at only 8 pounds.

Bolt and sleeve construction makes

possible the erection of these triangular towers, in lengths from 90 to as great as 425 feet, by unskilled labor. A 4-

man crew is sufficient for all towers, and the erection time runs from 10 hours for the 90-foot tower to 50 hours for the 425-foot mast.

Full details can be obtained by writing direct to the manufacturer and mentioning this news item.

### Indiana Appoints Four To Highway Positions

The following appointments of division heads have been announced by the State Highway Commission of Indiana: Carl E. Vogelgesang has been named Chief Engineer, taking the place of Ray Bower who resigned; Fred Kellam has been reappointed Engineer of Bridges; and Charles T. Miser is now Superintendent of Maintenance, replacing Norman F. Schafer, who is now a member of the Commission. John H. Lauer, Commission Chairman, also announces that J. T. Hallett, Indianapolis city traffic engineer, has accepted the post of Engineer of Road Design, formerly held by Mr. Vogelgesang.

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AMERICAN CABLE DIVISION  
AMERICAN CHAIN & CABLE

In Business for Your Safety

# Access Road

(Continued from page 6)

across the road from four to six times.

After 24 hours of traffic over the base course the surface had hardened to about a 2-inch depth but was not fully compacted beneath. This upper crust was therefore scarified and bladed by the power grader and again rolled by the pneumatic roller from the center line to the edges of the road.

#### Surface Treatment

After the base had dried out, the time required depending on weather conditions, all loose material was removed from the surface by a Grace three-wheel rotary sweeper in preparation for the bituminous prime coat which preceded the three applications of surface treatment. The surface treatment was 20 feet wide but the prime was applied to the full 22-foot width of the base course in order to give more stability to the base and to prevent the edges of the surface treatment from raveling. During these operations the road was closed and traffic sent around a detour.

A Littleford 1,080-gallon pressure distributor with a 22-foot spray bar applied the prime coat of MC-2 cut-back asphalt at the rate of 0.3 gallon to the square yard at temperatures ranging from 140 to 175 degrees F. This light grade of asphalt penetrated approximately  $\frac{1}{4}$  inch of base. After a 3-day wait to permit the prime to cure, the surface of the base was swept lightly by the rotary broom from the center to the edges, care being taken not to dislodge any of the base material.

Then the base was given its first application of surface treatment with a 20-foot distributor spray bar. This shot consisted of 0.4 gallon of AC-2 200 to 250-penetration asphalt to the square yard, applied between 275 and 350 degrees F. The asphalt was immediately covered with a thin layer of coarse-aggregate gravel at the rate of 0.02 cubic yard to the square yard, and spread by the same trucks used for hauling the gravel. The gravel was distributed through four Yarn mechanical spreader boxes, 7 feet wide, which were hooked on the back of two trucks, one of which spread the 7 feet nearest one edge of the road, and was followed closely by the other truck taking the next 7-foot strip. One of the boxes was then closed off for 1 foot at one end to take care of the remaining 6 feet of road width. The gravel used in this first treatment had the following gradation:

Sieve Size	Per Cent Passing
1½-inch	100
1-inch	90-100
¾-inch	40-70
½-inch	0-10

#### Brooming and Rolling

A drag broom was then pulled over the surface by the International tractor to spread the coarse-aggregate gravel uniformly over the surface. This broom consists of a light timber frame, 12 feet wide x 8 feet long, with one diagonal member. Lengths of fiber broom, 4 inches wide x 10 inches high, are placed under the two 12-foot cross members and under the diagonal member. The broom was dragged along each side of the road first so that the diagonal piece pulled towards the center, keeping the gravel on the road and not throwing it off to the sides, thereby losing material and destroying the crown of the road. When one side of the road had thus been swept, the broom was unhooked from the truck which turned around, the broom was re-attached, and started back in the other direction. The broom was turned around in order to keep the diagonal piece always pulling towards the center of the road. When both sides were dragged, then the center was broomed. The broom was pulled very

slowly to keep it from jumping off the surface. This was followed by three or four men with hand brooms going over the road, spreading out any bumps that had escaped the drag broom. The surface was then rolled by a 7½-ton 3-wheel steel roller operating from the edges of the road in towards and parallel to the center line.

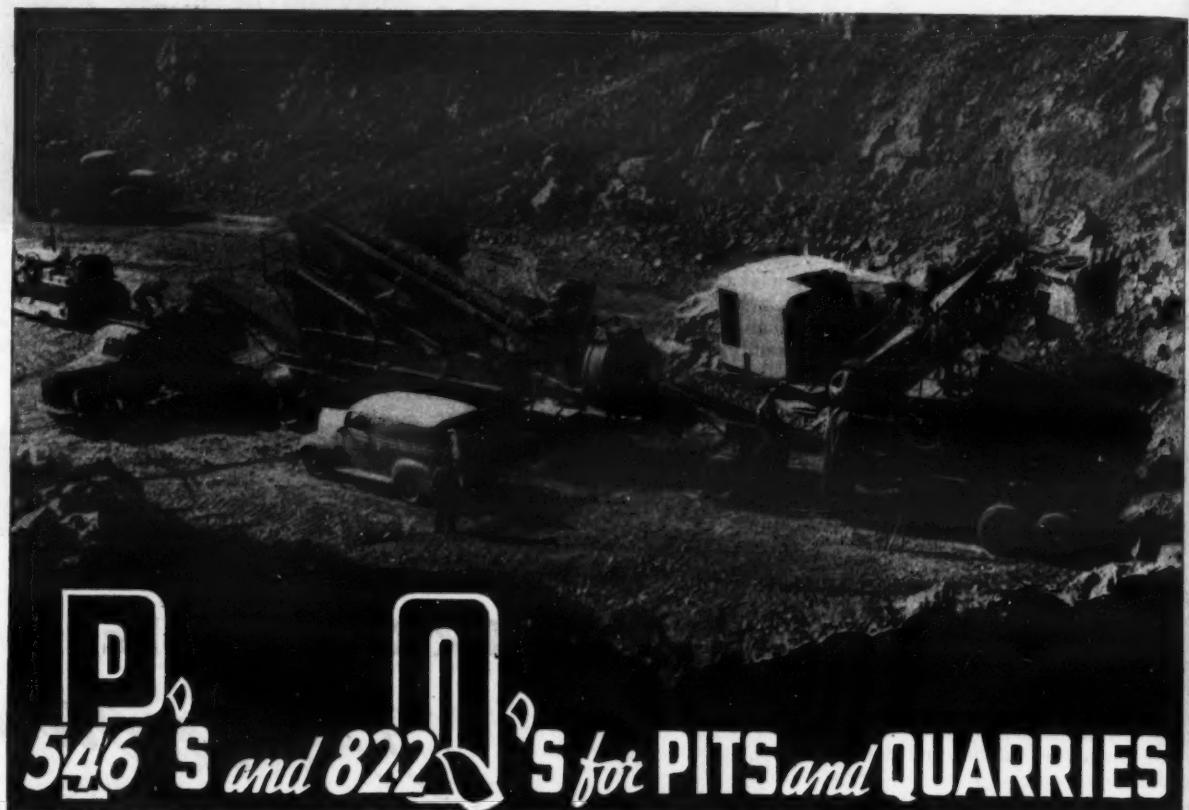
#### Further Applications

If the gravel used in the first treatment was dry, the second application was put on immediately; otherwise there was a wait until the gravel dried out. Then a second application of AC-2, with the same penetration and at the same temperature as before, was sprayed on, also at the same rate of 0.4 gallon to the

square yard. This was covered with a fine-aggregate gravel at the rate of 0.0118 cubic yard to the square yard in the following gradation:

Sieve Size	Per Cent Passing
¾-inch	95-100
No. 4	0-7

The aggregate was broomed and  
(Concluded on next page)



**P's and Q's for PITS and QUARRIES**

Gallagher-Nelson of Oregon, Ill., know their P's and Q's. Having some time ago purchased a Universal No. 800 gravel plant consisting of a 40"x 22" roller bearing roll crusher, 4' x 12'-2½ deck screen with a 30" feed conveyor on a pneumatic tired truck, it was a simple matter to convert this unit into an 822-Q rock crushing plant by the addition of a No. 546-P primary unit. This unit consists of a 20" x 36" WRB jaw crusher, a 36" x 8' apron feeder, a grizzly with by-pass, and a 30" under-conveyor—all mounted on a pneumatic tired truck. We repeat—Gallagher-Nelson know their P's and Q's.

An inbuilt feature of Universal gravel and rock crushing, screening and loading plants long recognized by contractors and public works officials is the ease with which new standardized units may be added to increase capacity, to change over from gravel to rock crushing or to add washing or other processing not included in the original plant.

Ask your Universal dealer to show you these exclusive design features common only to Universal-engineered equipment.

A general view of Gallagher-Nelson's Universal 546-P primary crushing unit and "800" secondary crushing unit forming the "822-Q" quarry plant shown working near Polo, Ill. Note the close-coupled compactness of this electrically-powered rock reduction plant.



Close-up of the 546-P primary unit. Electrically-driven, it consists of a 20" x 36" WRB jaw crusher, a 36" x 8' apron feeder, a grizzly with by-pass and a 30" under-conveyor.

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Road clearance is reduced to a minimum—loading and unloading are simplified—and loads move under bridges and low obstructions that would otherwise necessitate long detours and costly delays.



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EXPERIENCE PERFORMANCE

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# Access Road

(Continued from preceding page)

rolled as in the first treatment. The third application, also of AC-2 asphalt, at the same temperature and with the same penetration, was applied at the rate of 0.2 gallon to the square yard. The final seal coat which followed consisted of a still finer gravel applied at the rate of 0.0075 cubic yard per square yard, with the following gradation:

Material	Sieve Size	Per Cent Passing
Gravel	No. 4	90-100
Gravel	No. 20	50-60
Gravel	No. 50	10-40
Sand	No. 100	0-5

The drag broom was not pulled over the seal coat as it would dislodge the fine aggregate that already had been fixed in place within the interstices of the heavier aggregate. It was gone over lightly, however, with the hand brooms and then rolled. Traffic was sent over the road for three days, after which time four tiny windrows of seal-coat aggregate were observed beside the four lines of tire tracks. In an operation known as "backsweeping", the rotary broom dispersed this material over the entire road surface, working from the edges back to the center. If any "bleeding" occurred in the surface, the steel roller was put back on to key the aggregate further into the bituminous material. The entire thickness of the three applications of surface treatment was not over 1½ inches.

The asphalt used on this job was purchased from the Standard Oil Co. of Louisiana at Baton Rouge, and was transported 160 miles over the N. O. T. & M. railroad in tank cars to a siding near the airport. The temperature of the asphalt when it was loaded was 200 degrees F, which had dropped to around 150 degrees F at the end of the trip despite the insulation on the tank cars. To heat the asphalt to the required temperature, the contractor used a Grace tank-car heater mounted on four rubber tires which was rolled up alongside the tank car, together with the 800-gallon water tank truck, and the Littleford 1,080-gallon distributor. Water from the tank truck was piped into the asphalt heater which converted it into steam which was sent through the heating coils in the tank car, raising the asphalt to the desired temperature. The asphalt was then pumped from the car to the distributor by the pump on the asphalt heater. The heater operated on 40-octane tractor fuel.

## Personnel

Work on this 2.06-mile contract of sand-clay-gravel base and surface-treatment reconstruction on the access road to the De Ridder Fighter Base Field in southwestern Louisiana started on November 1, 1944, and was completed by the end of March, 1945, at a cost of \$41,030. Tom Smith was Superintendent for the contractor, W. R. Aldrich & Co. of Baton Rouge. R. B. Richardson is Construction and Maintenance Engineer for the Louisiana Department of Highways, and E. H. Goodloe and W. C. Youngs are District Engineer and Construction Engineer, respectively, for District 4 in which the project was located. E. F. Oakley was Resident Engineer.

## New General Manager, Olin Explosives Division

F. S. Elfred, Jr., has been appointed General Manager of the Explosives Division of Olin Industries, Inc., East Alton, Ill., and its subsidiaries, including Western Powder Mfg. Co., Peoria, Ill.; and Liberty Powder Co., Koppers Building, Pittsburgh, Pa. Mr. Elfred also will assume duties as General Manager of the Equitable Powder Mfg. Co., East Alton,

Ill., and its affiliates, The Columbia Powder Co., Tacoma, Wash.; Egyptian Powder Co., Pollard, Ill.; and The Texas Powder Co., Dallas, Texas. Products of these companies include all grades of blasting powder and dynamite and a complete line of blasting supplies.

Other appointments announced in the Explosives Division include R. R. Casteel, Secretary; John Caruthers, Assistant Secretary; and E. J. Krupp, Assistant Treasurer.

## High-Pressure Pumps For Special Service

Moyno screw-type pumps, originally sold for high-pressure fire duty and used by U. S. Engineers on the Mississippi also for washing silt and dirt from concrete flood walls, have been used effectively in many high-pressure services, such as delivering water through long small-diameter pipe lines, the handling of fuel oil to equipment through similar small lines, and other operations.

Bulletin 1777 issued by Robbins &

Myers, Inc., Pump Division, Springfield, Ohio, manufacturer of Moyno pumps, describes these units completely, featuring their efficiency and simplicity of

action. Copies of this bulletin may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY by writing direct to the manufacturer.

**"Simplified"**  
**ARC WELDING**

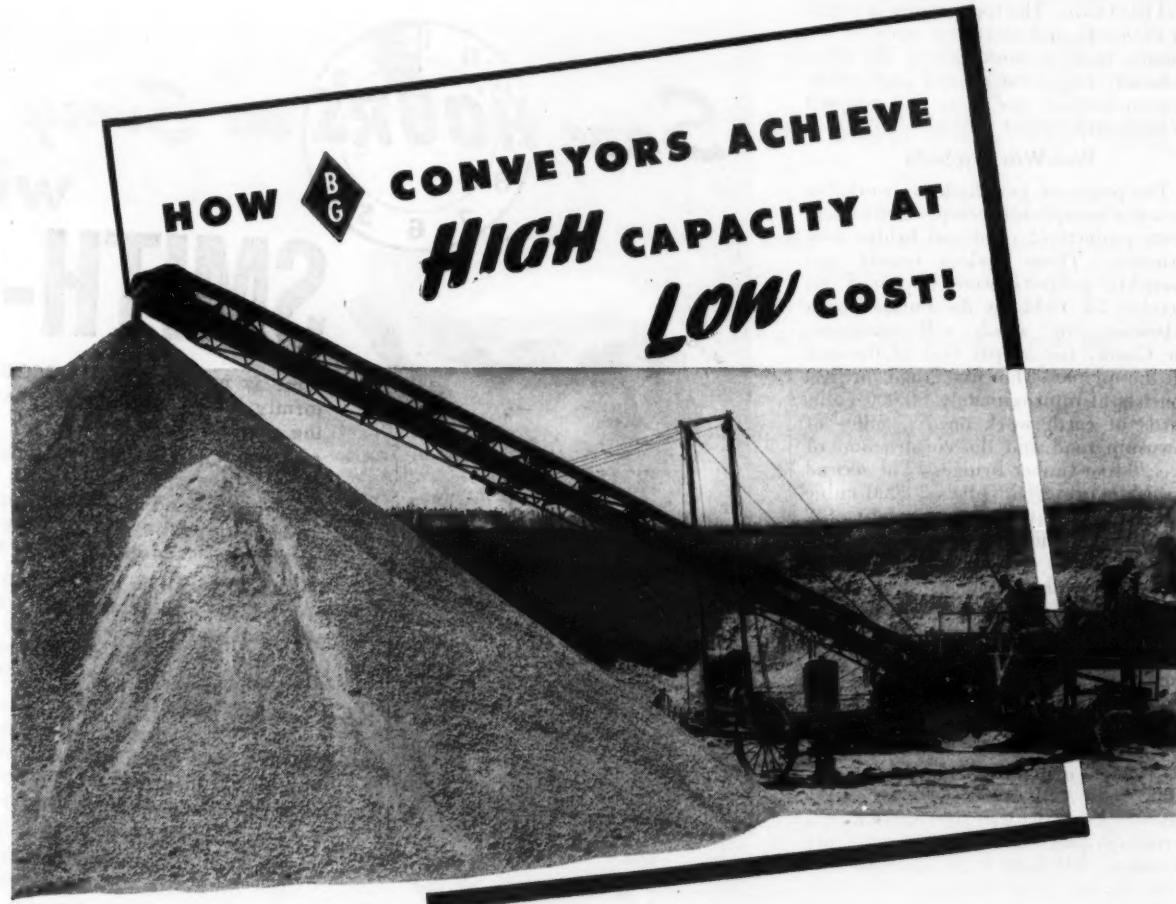
It's easy to meet completion dates and be sure of sound construction when Hobart Gasoline Driven Arc Welders are on the job. Hobart's Multi-Range Dual Control and exclusive Remote Control allows the operator to make adjustments so quickly and easily that he's bound to get HOBART BROS. CO. Box CE-65, TROY, O.

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**Barber-Greene** **Constant Flow Equipment**



# Post-War Projects Planned by County

**Rural County in Northwest Kansas Has Five Approved Projects; Maintenance and Organization; Bridges**

By FRANK ANDERSON, County Engineer, Cheyenne County\*, Kansas

\* CHEYENNE County, Kansas, has been alert to the needs of its highway system and has five projects already approved by the Public Roads Administration for construction with secondary-road funds available under the recent Federal-Aid Act. The county is located in the extreme northwest corner of the state, with an area of 1,020 square miles and a population of 5,164, of which 1,793 live in the two cities in the county, St. Francis, the county seat, and Bird City. The topography is rough in the north and southwest parts of the county, making stock raising the chief industry, while the central and southeastern sections are level and adapted to large-scale wheat raising.

## Post-War Projects

The proposed new highway work for post-war completion comprises five separate projects of road and bridge construction. These various county and township projects were approved on October 25, 1944, by the Public Roads Administration which will reimburse the County for 50 per cent of the cost of the plans. The first road project consists of approximately 60,000 cubic yards of earth work on  $7\frac{3}{4}$  miles of township road and the construction of two 20-foot timber bridges. The second township project involves 20,000 cubic yards of earth work in a distance of 2 miles and  $1\frac{1}{2}$  miles of elevating-grader work, with the construction of one 20-foot-span timber bridge. The third township-road improvement project will require 60,000 cubic yards of earth work,  $1\frac{1}{2}$  miles of elevating-grader work, and the construction of one 40-foot-span timber bridge.

The fourth project consists of the construction of fourteen 30-foot spans of timber bridge and approximately 8,000 cubic yards of earth work on the approaches. This will be a section of a farm-to-market road connecting County Highway 369 with U. S. 36 and also with Kansas 27 at Wheeler. The fifth project covers a distance of 15 miles on County Highway 345 from St. Francis to the Kansas-Nebraska state line. It consists in the elimination of hazardous curves, improvement of sight distances through the relocation of various portions of the present highway, the improvement of the grade, the reconstruction and enlargement of the present drainage structures, and the placing of 600 cubic yards of gravel per mile.

Owing to the scarcity of labor, it has been impossible to date to secure the necessary help to send out a field party to complete the surveys for these projects. However, the surveys and the actual drawing of the plans will go forward just as soon as the man-power situation will permit.

## County Road Maintenance

Cheyenne County has 122 miles of gravel-surface highways and  $53\frac{1}{2}$  miles of dirt roads, making a total of  $175\frac{1}{2}$  miles of county highways. There are no paved or oil-surfaced roads.

The pre-war maintenance organization consisted of three continuously employed motor-grader operators, and part-time crews for filling washouts, cleaning culverts, burning weeds, and

other standard maintenance operations. County maintenance equipment consists of three Adams Model 51 motor graders and one Adams Model 511 motor grader. The construction equipment includes three Caterpillar RD7 tractors, one International TD-18 tractor, one Adams 42-inch elevating grader, one Caterpillar 42-inch elevating grader, two Adams 12-foot leaning-wheel graders, one LeTourneau G6 Carryall, one Farmall Model M tractor with front-end loader, two  $1\frac{1}{2}$ -ton trucks, and three pick-up trucks.

Very little change due to the war has been made in the maintenance system. Construction has been completely eliminated and, as far as possible, construction equipment is being used to assist in maintenance. The three motor grad-

ers are still operating according to their pre-war schedule, while the new Adams Model 511 motor grader, which was purchased in May, 1944, is also steadily employed. In addition to these four machines, the scraper and the two 12-foot blade graders are used to assist in maintenance whenever operators are available.

Due to lack of laborers within the various townships, a much greater portion of the township maintenance has been turned over to the County, thus requiring the use of construction equipment for maintenance purposes, which never occurred prior to the war.

The central garage for the care of all of the county road equipment is located in St. Francis. The garage is a brick building 28 x 40 feet and is used for housing trucks and pick-ups as well as for repairing the road machinery. Normally, each unit of equipment is taken into this garage and thoroughly overhauled or necessary repairs made during the winter months.

The garage is equipped with chain

hoists for handling heavy motors, track gears, etc., which must be removed in the overhaul of the various units. So far, all track-press work has been done by privately owned machines, which are pulled out of the dealer's service shop to do the job. In case the press cannot be obtained when needed, the tracks are loaded on a county truck and hauled to the service shop. This latter plan has been used during the present shortage of labor.

A secondary, or district, garage is located at Bird City. This garage has no facilities for the overhaul or repair of heavy equipment. It is a small wood structure with just sufficient storage room for two trucks, a number of oil barrels, road signs, etc., but is used for the overhaul and repair of trucks and pick-ups.

The present plan of the County is to purchase, as soon as they are available, two new Adams Model 51 motor graders, four 2-ton trucks, and one machine for loading road gravel at the dry pits.

(Concluded on next page)

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**FASTER CHARGING** — Operator stays in cab. No hatch to open, clean and close again. Aggregates drop vertically into big, roomy feed chute and continue by gravity at high velocity toward opposite end of drum. No shafts or rods to clog up chute. Fastest loading cycle on the market.

**FASTER MIXING** — Drum rotates during charging operation. Shrinking and mixing start the instant a batch enters drum. This means faster and better mixing, also increased drum capacity. And while mixing, you can look into drum and SEE what's going on. No inspection delays.

**FASTER DISCHARGE** — Open sealing door as far as you wish and reverse rotation of drum. Instantly the uniformly mixed concrete is discharged by gravity . . . as fast or slow as you want it . . . any quantity you desire. The speed of the drum controls the speed of discharge.

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*The Original High Discharge TRUCK MIXER and AGITATOR!*

\*Mr. Anderson became County Engineer of Sherman County, immediately to the south of Cheyenne County, shortly after this article was completed, having served Cheyenne County as its Engineer for five and a half years.

# Post-War Projects Planned by County

(Continued from preceding page)

For the central garage, the purchase of one large turning lathe, one power-operated hydraulic track press, and one pneumatic greasing outfit which can be used in the field along with the construction equipment is anticipated.

#### Bridges

Cheyenne County has 176 bridges varying in length from 10 to 460 feet and totaling 7,610 feet. All of these bridges are of the timber-trestle type and are built according to Kansas State Highway Commission specifications for H-10 loading. As provided by law, any drainage structure over 6-foot span is considered as a county structure even though located on a township road.

Any bridge located on a county or township highway is maintained by the County Highway Department. The Engineer inspects all bridges at least twice each year, at which time the needed repairs are recorded, and the necessary material requisitioned. At such times as weather conditions or breakdowns of machinery prevent grading operations, the machinery operators are taken out to do bridge repair work. There are no special bridge crews.

As far as possible, all new construction and all major repair jobs on bridges are done during the winter when freezing weather prevents the operation of grading equipment. Small jobs, however, which require immediate attention, are done at once by the operators of maintenance or construction equipment.

#### Organization

The Board of County Commissioners is comprised of three men who are elected for four-year terms. Two of the Commissioners are elected at the same time as the President of the United States and the other Commissioner is elected two years later. Thus there is always one experienced Commissioner in office, regardless of election results. The present Commissioners are Marvin Mills, Chairman of the Board, Fred Magley, and L. A. Munn. All highway work is directly in charge of the County Engineer, who in turn is responsible to the Board of Commissioners which appoints him to serve as long as he proves efficient. His appointment must be approved by the State Highway Commission.

Aside from the county highway system, there are seventeen townships within Cheyenne County, each of which has an individual highway system. Since these townships do not receive sufficient money to enable them to buy construction or maintenance equipment, the County Engineer and Commissioners have formulated a plan with the various township boards whereby the County uses its equipment to build and maintain roads for the townships, which in turn pay the County an agreed price per mile. This plan, which was started in 1940, has proved very successful, in that many miles of township roads are now graded and maintained.

The County Highway Department is managed by the County Engineer who recommends to the Commissioners what machinery or supplies should be purchased. These recommendations are approved or rejected at a regular meeting. In order for a purchase order to be effective, it must be signed by the three Commissioners, the Engineer, the County Clerk, and the County Attorney. When such an order is issued, the equipment or materials thus purchased may be used in any one of the three commissioner districts. This plan works very efficiently in a county with a low taxable valuation as it permits purchases to be made in reasonably large quantities, and

makes possible the payment of cash at the time of purchase.

A highway or bridge project which would be too large to be constructed by any one district can be handled very efficiently through the cooperation of the three districts. The money spent by the Highway Department may not be equally divided among the three districts each year; however, over a period of three or four years each district acquires its share of the funds and has accomplished the construction of projects which would not have been possible had the districts worked individually.

The County Commissioners are active in all state and county officials' organizations through attendance at all meetings possible. The present labor shortage has confined them mostly to their farms and ranches. The author is a member of the Kansas County Engineers Association, the Kansas Engineering Society, and the American Road Builders' Association.

*Back the attack with War Bonds!*

# 205 HALF-YARD

## Saves ONE-HALF the Cost OF AN EXTRA PULL SHOVEL BOOM

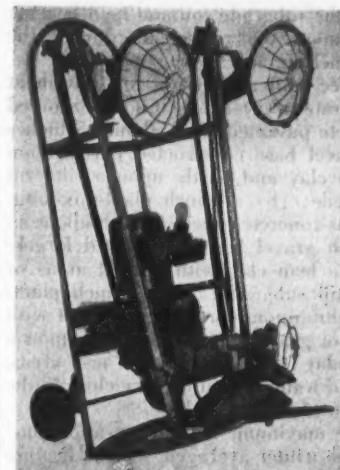
You save one-half the cost of separate pull shovel boom. The same features that make the Two-in-One boom a better shovel boom, make it a better pull shovel boom as well. Rigidity and strength, built in to meet shovel requirements, eliminate dipper weaving on the pull shovel, makes possible full use of sidecutters. The boom foot drum that gets a double cable pull into the shovel crowd action also gets a double cable pull into the pull shovel digging action.

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## 2 IN 1 BOOM



HEAVY-DUTY CONSTRUCTION EQUIPMENT



## PORTABLE LIGHTING PLANT

COMPLETE • NO EXTRAS TO BUY

Can be taken anywhere and put in operation immediately. Ideal for construction jobs • maintenance work • unloading trucks and cars. The 600-watt, 110-volt, DC generator and air-cooled gasoline engine are mounted on a steel hand truck. Unit includes 2 large, adjustable standard, 200-watt flood lamps: a 150-watt spot light: 20-foot extension cords on all lights. Weighs only 190 lbs. and operates 4 hours on 2 quarts of gasoline. Can be used to power portable tools such as drills, saws, etc.

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## Frost Investigations On Runway Subgrades

Between February and August, 1944, an investigation was carried on at Dow Field, Bangor, Maine, to determine the effect of frost action in the subgrade soil beneath three paved areas upon the load-supporting capacity of these pavements. A paper by William L. Shannon, Chief, Soils and Geology Section, Boston District Office, U. S. Engineer Department, prepared for the Twenty-Fourth Annual Proceedings of the Highway Research Board, reports on the results of these investigations.

The investigation consisted of the following components: (a) detailed explorations and tests to determine pavement, base, and subgrade conditions in the selected test areas; (b) observations of pavement heaving and ice-lens formation in the subgrade during the freezing period; (c) performance of traffic tests using wheel loads from 10,000 to 40,000 pounds during the frost-melting period; (d) field California bearing ratio tests

upon the subgrade soil and field bearing tests upon the pavements during the frost-melting and summer periods.

Three different types of pavement were tested: (a) a 7-inch non-reinforced concrete pavement with about 15 inches of gravel base constructed partly upon a lean clay and partly upon a silty till subgrade; (b) a 4-inch plant-mix bituminous-concrete pavement with about an 18-inch gravel base constructed largely upon a lean clay with limited areas of silty till subgrade; (c) a 4-inch plant-mix bituminous-concrete pavement with a 3-foot gravel base constructed upon a lean clay subgrade. In all test areas, ground water was at or very close to the bottom of the gravel base.

The maximum frost penetration during the winter averaged 4 feet. Heaving of the pavements ranged from zero in the thick gravel base areas to 0.6 foot in the areas of thinnest base. Ice lenses were observed to be thin and widely spaced in the subgrade immediately beneath the base, becoming thicker and closely spaced at the maximum depth of

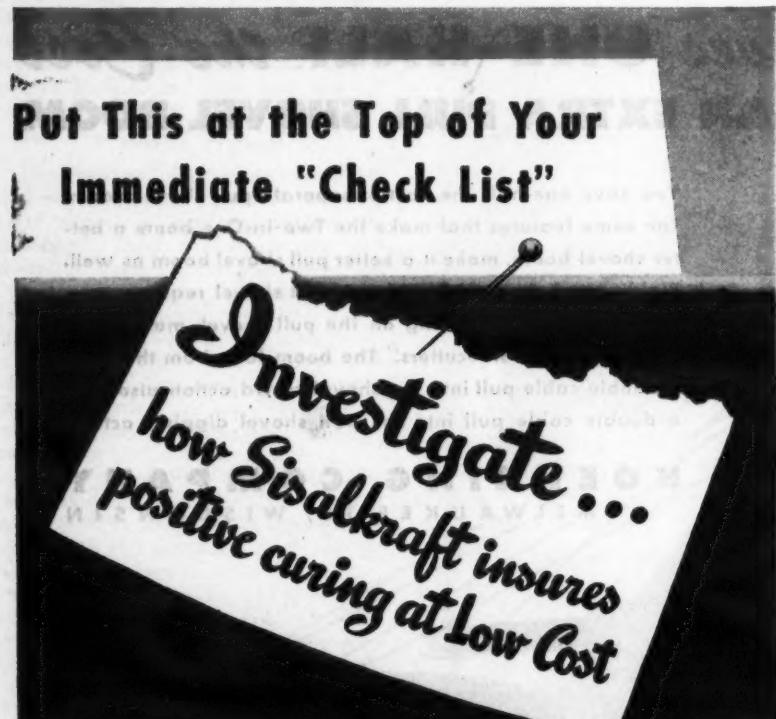
frost penetration.

During the frost-melting period, one pavement failed under test traffic and two pavements showed definite indications of distress, traffic on one being stopped before failure occurred. On all test areas, daily traffic corresponding to the range of traffic expected under use

by planes was applied.

The investigation indicated conclusively the necessity for considering the effect of frost action in subgrades upon the plane-supporting capacity of pavements constructed thereon.

*Oil is ammunition. Use yours wisely.*



Time Tested... Field Tested

## STSALKRAFT

### Cures and Protects

Sixteen years of experience has established that Sisalkraft is "tops" as a concrete curing and protective agent. Once in place, curing is automatic . . . no sprinkling . . . no watching . . . no human element. Equally important, Sisalkraft can take plenty of abuse without scuffing, protects against drippings and debris, thus assuring a clean, hard, smooth, dense surface that makes grinding of floors unnecessary.

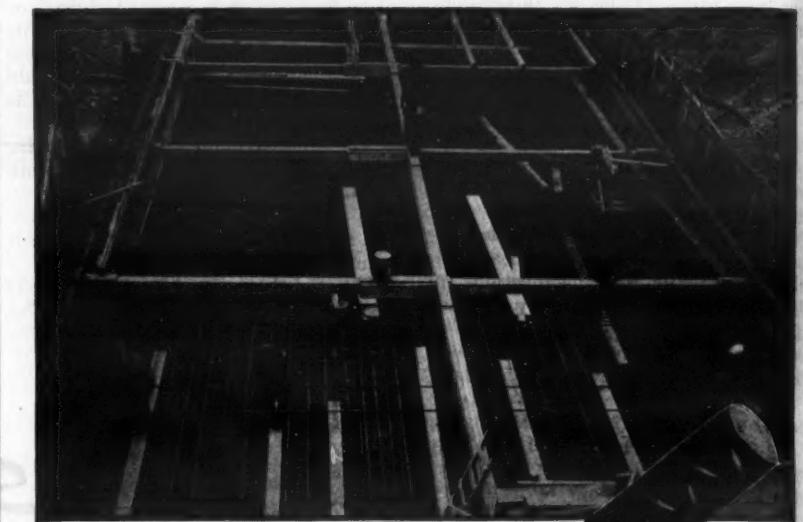
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Use Sisalkraft to cover and protect equipment against weather . . . line construction shanties . . . cover stock piles . . . for closing in . . . over sub-fills . . . over sand cushions under terrazzo . . . to cover brick courses . . . as all-round building protection.

War production has restricted immediate availability — but after the war, as before, the Sisalkraft dealer organization will be ready to serve you in 48 states.

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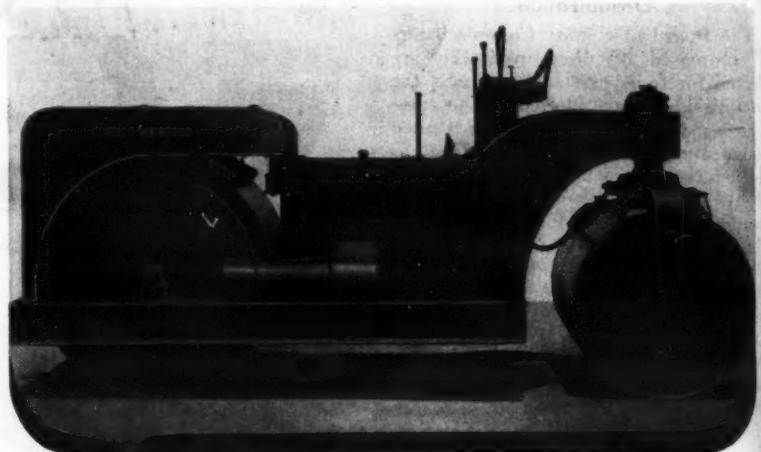


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Buffalo-Springfield Rollers  
on resurfacing jobs**

THE TRANSVERSE MOUNTING of the engine and simple, bevel gear drive provide such smoothness in reversing and freedom from vibration that they are ideal for finishing bituminous surfaces. Large, wide rolls combine high compression with large capacity. Watch Buffalo-Springfield Tandem Rollers, talk to their owners and you'll see why they are preferred by the road building industry. In addition to tandem rollers from 3 to 17 tons, the line of Buffalo-Springfield rollers includes three-wheel rollers from 6 to 12 tons, 3-axle tandems from 9 to 17 tons and trench rollers for widening work.



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# Changes in Designs For Concrete Paving

## New Jersey's New Highways Will Benefit From Studies Of Corrosion of Dowels And Pumping of Slabs

THE report of New Jersey to the Highway Research Board on the pumping of concrete pavements, submitted by William Van Breemen, Engineer of Special Assignments, New Jersey State Highway Department, and other recent papers by him contain valuable data on the corrosion of load-transfer dowels in concrete pavements, and how the New Jersey studies have changed pavement design. The material published here is composed of excerpts from Mr. Van Breemen's papers.

### Effect of Rusting Dowels

It is now quite definitely known that in some of the older pavements progressive rusting of the dowels has resulted in a material increase in their sliding resistance in recent years. The restraint to pavement contraction thus induced has led to detrimental cracking in some locations. For this reason, the dowels used in future construction will consist of an inherently corrosion-resistant material such as stainless steel or, if it proves to be possible to do so, they will be protected in some manner positively to prevent corrosion. The corrosion of dowels, with the excessive restraint to sliding it may ultimately induce, is a phase of joint design which should receive the serious consideration of all highway engineers. The merits of various dowel shapes, dowel materials, and means to facilitate free sliding permanently are at present being intensively studied in New Jersey.

A few months after the Highway Research Board paper was submitted, an investigation was made to determine the cause of excessively wide cracks which had recently been noted in some New Jersey pavements. Although many of these cracks probably existed as relatively narrow, more or less harmless cracks for some years, they apparently began to widen appreciably during the past year or two. This investigation disclosed that the sliding resistance of the dowels in the expansion joints had greatly increased in recent years. The concrete was removed to expose the dowels at a joint suspected of offering excessive restraint. The dowel surfaces were found to have rusted considerably, notwithstanding having been given two coats of paint, white lead and red lead, and a coat of oil prior to installation, and in spite of being surrounded by dense concrete. The sliding resistance was determined with a special dowel puller. During the six-year period this joint was in service, the sliding resistance had increased from what was probably less than 1,000 pounds to an average of 18,000 pounds per dowel. These dowels consisted of 2-inch depth channels, 20 inches long. The restraint to sliding appears to be due to the confinement of the rust which, in forming, exerts a very considerable expansive effort. This expansive effort is, in effect, a squeeze which grips the dowel and greatly restrains its movement. The detrimental effects of corrosion are apparently not limited to the larger size of dowels because similar wide cracking has occurred in some of the older pavements in which joints with  $\frac{1}{4}$ -inch round dowels were installed.

At the time the paper was prepared it was the intention to install  $1\frac{3}{4} \times 1 \times 20$ -inch-length dowels. However, inasmuch as it has since been quite definitely determined that corrosion is a factor that positively must be reckoned with, especially in the case of dowels having a

large surface area, New Jersey has given further thought to the designs and has undertaken intensive studies to determine the most practical means to prevent corrosion or avoid its effects. This is being done, even though the  $1\frac{3}{4} \times 1$ -inch dowels were to be provided with sleeves and felt liner and even though that kind of assembly might never cause any difficulties. These studies are not yet completed and, therefore, it is still undecided as to the dimensions of future dowels and as to the materials, except that their bending resistance within the elastic limit will not be less than 7,500 inch-pounds and they will be spaced 12 inches on centers.

**New Pavement Design**  
Pavement thickness for heavy-duty

concrete highways will be uniform, of 9 or 10 inches, with the slab length approximately 60 feet without dummy or contraction joints. The load-transfer device in expansion joints will consist of dowels, probably corrosion-resistant, or permanently protected against corrosion, each having a bending resistance within the elastic limit of not less than 7,500 inch-pounds, on 12-inch centers.

As a result of recent experimentation with compressed wood, the joint filler will be  $1\frac{1}{8}$ -inch cypress, fabricated with the grain direction vertical and with a sealing strip added at the bottom.

Longitudinal reinforcement in the slab will consist of a single or double line of  $\frac{3}{8}$ -inch-diameter bars spaced  $7\frac{1}{2}$  inches center to center or the equivalent in welded steel mats. The longitudinal joints will be of the tongue-and-groove type or with tie bars.

The sub-base under all pavements on impervious erodible soils, or those susceptible to frost action, will have a minimum thickness of 8 inches of sand, sand-gravel, or cinders.

The sizes, thickness, or distribution of material in concrete pavements may be modified so as to result in a design of sufficient strength or durability at somewhat less cost. A great deal more has still to be learned about the influence and effectiveness of all the elements involved before the ideal balance of materials and parts becomes attainable. But the essential features of the design as given here are those of pavements which have been carrying heavy trucking in New Jersey for some years past with negligible evidence of deterioration attributable to traffic.

### Portable Washing Units

Portable and semi-portable gravel washing plants are very completely illustrated and described in a new bulletin, Form No. 556, issued by Pioneer Engineering Works, Inc., 1515 Central Ave., Minneapolis 13, Minn. The illustrations show the plants in combination with complete screening and crushing plants, and with screening plants alone.

# BIG all the way through

When you see the new Ward LaFrance commercial models, you'll be looking at something new in transportation . . . the toughest, sturdiest job on the highway. It's the "civilian" version of the great M1A1 Heavy Wrecker we have been turning out in volume for the Army, developed to be the last word in rugged truck performance . . . The new Ward LaFrance heavy-duty trucks are "built big" not only in rated capacity, but all the way through.

. . . If your fleet suffers from the usual profit-eating toll of axle failures, broken springs, burned clutches, the new Ward LaFrance is the common-sense answer to more dependable, lower-cost hauling. This stamina comes from a basic engineering principle of providing strength, more than sufficient for your requirements. Ward LaFrance has evolved a sales plan of unusual interest, which you should investigate. Write to our Sales Department today for details.



**WARD LAFRANCE**  
TRUCK DIVISION

GREAT AMERICAN INDUSTRIES, INC., ELMIRA, NEW YORK



## German Rubble Used To Build Army Roads

Roads came first recently in Germany as is shown by these two Signal Corps photographs. In one, a Caterpillar D4 tractor with bulldozer, operated by a member of the U. S. Army Engineer Corps, is breaking open a road. When he had finished, other Engineer troops placed planks across the freshly laid roadbed and then covered the planks with dirt and stone to provide a solid footing for military traffic.

The other picture shows what has happened to German houses, as it became necessary to use part of them to complete a military road. A Caterpillar tractor, equipped with a push-pole, is knocking down the walls of a bombed German dwelling to provide rock fill for the men who are building new roads and repairing damaged arteries.

## Study of the Effects Of Curing Methods

The progress of an investigation to compare the effectiveness of various concrete-curing procedures is to be reported in the Twenty-Fourth Annual Proceedings of the Highway Research Board by H. C. Vollmer, Research Associate, National Bureau of Standards. This investigation includes the use of burlap, the use of several liquid curing compounds, and the use of calcium chloride, both integrally and as a surface application. The study includes tests of concretes cast and cured at 70 degrees F and at a relative humidity of 50-60 per cent. The evaluation tests include flexural strengths of beams, compressive strengths of beam ends, and resistance to abrasion of the cured sur-



Left, a member of the Army Engineers carves out a new road in Germany; above, Engineer troops use rubble from bomb-damaged buildings, of which there is plenty at hand, for rock fill for a new road.

faces.

The use of damp burlap for 18 hours, with calcium chloride used either integrally in the concrete or spread on the surface of the concrete upon the removal of the burlap, resulted in strengths only some 7 per cent lower than those obtained by the procedure requiring burlap. The 28-day flexural strengths obtained by the use of liquid curing compounds were 16 to 19 per cent lower

construction. The use of surface calcium chloride applied as soon as the bleeding water disappeared, with no burlap at all, resulted in strengths only some 7 per cent lower than those obtained by the procedure requiring burlap. The 28-day flexural strengths obtained by the use of liquid curing compounds were 16 to 19 per cent lower

than those obtained with the 3-day burlap curing procedure. Flexural strengths obtained by continuous damp curing of the specimens for 28 days, which, however, is not a practical method under field conditions, were higher than obtained by any other procedures described, and strengths obtained in specimens receiving no curing treatment were considerably lower.

Tests of the resistance to abrasion of the top cured surface of the specimens in which 1½ per cent calcium chloride was used integrally and 1½ pounds per square yard applied to the surface as soon as the bleeding water disappeared, with no burlap, and of all specimens cured by employing the surface application of calcium chloride whether in conjunction with burlap or not, indicated a higher wear resistance than specimens cured with wet burlap applied for 3 days. However, the wear resistance of specimens with liquid curing membranes or with no curing was somewhat less than the specimens cured with wet burlap applied for 3 days.



## Taking the Bumps Out of America's Highways!

**FLEXCELL**—of the famous Celotex family—is the modern *approved* bituminous fibre expansion joint material for all highway and general concrete slab construction.

Made of long, springy Celotex cane fibres, Flexcell compresses under pressure—springs back when the expansion pressure is removed. It never extrudes—keeps the highway surface smooth and serviceable.

Flexcell is light, easy to handle. It can be set flush or it can be set below the slab surface with poured capping. Proved by years of service in American roads—with "never a bump in a million miles."

Write for sample and complete information.

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World's Largest Manufacturer of  
BITUMINOUS FIBRE EXPANSION JOINT MATERIAL

*Made for the Job..*

Do not overlook the versatility of a LIMA shovel when buying excavating or earthmoving machinery. There are places and purposes where only a power shovel is the answer to your problem. LIMA shovels are designed to work in wet, muddy ground and tough rock digging as well as dry, loamy dirt. With a LIMA you are prepared to dig earth, rock, coal, ore, clay and many other types of material with assurance of big output regardless of the type of work. In addition to having a fast economical excavator you also have in a LIMA, a material handling crane, pull-shovel or dragline by simply changing front end equipment. When you buy for the future buy an all purpose LIMA and be prepared for any job. Write for a free bulletin TODAY!

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SHOVELS DRAGLINES CRANES  
4 Yd. to 5 Yds. 3 Tons to 100 Tons Variable

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AND SIZE FOR EVERY JOB



Hauling dirt for levee embankment at Brunswick, Miss. H. N. Rodgers & Sons Co., Memphis, Tenn., contractor, used Caterpillar D8 tractors and Athey wagons which carried 14-yard loads on a 1,200-foot haul.

### Research Improves Electric Blasting Caps

As the result of both chemical and mechanical research, all electric blasting caps now being produced by E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., have two improvements, nylon-insulated wires and rubber plug closures. Both the nylon and rubber for these new caps have been allocated by the War Production Board to speed the war effort.

The wire covering of tough abrasion-resistant nylon is the equal of enamel insulation in preventing current leakage. It is not affected by extreme or rapid changes in temperature and is in brilliant colors, minimizing the possibility of error in connections. In addition to reducing the possibility of misfires, the new wires are clean to handle and resist kinking. Formerly, blasting-cap wires were covered with impregnated cotton.

The rubber plug closures, double crimped in the shells, replace the combination of bridge plug, asphaltic waterproofing and sulphur seal, thus increasing resistance to water penetration. The new shells are much shorter than the old type without sacrificing explosive strength. These shorter shells make priming easier and safer.

Complete information regarding these improvements in electric blasting caps and their availability may be secured direct from the manufacturer by mentioning this news item.

### Fast Tooth Refilling On Shovel Dippers

A new two-piece dipper tooth for a wide range of digging and loading equipment, such as shovel dippers, clamshell and dragline buckets and trench buckets, has been announced by Daniels-Murtaugh Co., 625 C Ave., N.W., Cedar Rapids, Iowa. The two parts of these Wear-Sharp teeth are designated as the Penetrator Point and the Weldapter. The design makes it easy to replace the point, which is double-keyed to the Weldapter and tack-welded. When the point becomes worn, it is readily removed and a new point installed simply by slipping it on the Weldapter and tack-welding at several points along the side and across the end where the parts join. The double-key supports, one lengthwise and one crosswise of both parts, take all the digging stresses upward and downward as well as side thrusts and impact shocks.

The manufacturer states that the sharp thin cutting edge of the Penetrator Point works well even when digging tight compacted material, thus reducing power requirements and improving the efficiency of the dipper or bucket on which it is used. The points are of high-quality heat-treated alloy-steel forgings and are reported to stay sharp down to the time that half the part is worn away, necessitating replacement. The Weldap-

ter, not being subjected to wear, lasts practically indefinitely.

Complete information and prices of this new two-piece dipper tooth may be secured direct from the manufacturer by referring to CONTRACTORS AND ENGINEERS MONTHLY.

### Setting Up Welding And Cutting Outfits

A new 46-page fully illustrated bulletin describing in simple and understandable language how to assemble an acetylene welding or cutting outfit has been issued as Form No. 1 by Victor Equipment Co., 844, Folsom St., San Francisco 7, Calif. This bulletin was prepared especially for vocational training schools and beginners, and over 50,000 copies have already been distributed.

It is believed that many contractors and highway departments can use this booklet to advantage in training new operators. Copies may be secured gratis by writing direct to Victor and mentioning this announcement.

## SEND FOR FREE BOOKLET "Better Bases for Better Surfaces"

- If you are planning bases for immediate use or for higher type surfacing postwar, write today for a free copy of "Better Bases for Better Surfaces." This booklet gives specifications and construction details on the Solvay Calcium Chloride graded aggregate type of base. In addition, it covers these important points:
1. The relationship between density and stability.
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  5. How to improve bond between paved surfaces and bases.

*Write to Dept. 94-6 today.*

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### Machinery with a "pedigree"

## WORTHINGTON MOWING EQUIPMENT ready to solve your mowing problems in 1945

A long line of Worthington machinery is in use all over the world. Thousands of cutting units have been manufactured for our Air Forces and those of our Allies. Like the bombers and fighters that fly from Worthington cut airfields, our machinery has developed and improved — fast! War experience has tremendously increased our mowing and maintenance "know how."

This experience now comes to you . . . in the form of mowing equipment with a "pedigree" — rugged gang-mowers born in peace, developed in war, looking forward to a peacetime future on the highways of the nation, keeping shoulder and island turf in the best possible condition.

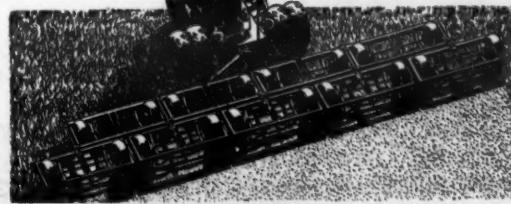
We stand ready to serve you. Won't you write us for full details about new Worthington Mowing Machinery, or for advice about your particular mowing problems.



THE ARMY-NAVY "E" PENNANT (with two stars) flies over our plant as a tribute from the Armed Forces to our employees for their fine war production record.

Worthington Distributors in 59 principal cities throughout the United States and Canada

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STROUDSBURG, PENNSYLVANIA • Established in 1914



## Parkway Bill Becomes Law in New Jersey

The Parkway Bill recently passed by the State Legislature of New Jersey has been signed by the Governor, making possible the construction of parkways and freeways. The five major principles in the law include the authorization for the construction of parkways or occasional parking areas, treatment of borders and landscape areas, and recreational and other necessary non-commercial facilities. It authorizes the acquisition of an average 300-foot right-of-way for the building of freeways except where more is needed for grade separations and connecting roadways. The law provides for "controlled access" in accordance with the best prevailing practice of the Public Roads Administration to reduce the danger of accidents by cars leaving or entering the parkway every few feet. The bill further authorizes the Highway Commissioner to restrict parkways to passenger vehicles, but if a whole highway is taken over for this

purpose the approval of the Public Utility Commission will be necessary to divert bus lines that have franchise rights over those highways. Finally, the bill prohibits the authorization or conduct of commercial enterprises or activities either by the State Highway Commission or any other agency of the state within or on the property acquired for and designated as a freeway or parkway, as defined in the act.

State Highway Commissioner Spencer Miller, Jr., expressed his complete approval of the act, stating, "New Jersey has now obtained legislation that in many ways would be a model for the rest of the nation. The 1945 Legislature will be remembered, among other things, for its notable contribution to highway development in New Jersey through the passage of the bill for parkways and freeways. This new law will enable New Jersey to begin in the post-war era a parkway development to link our playgrounds and recreational areas together by parkways which will insure not only travel that is safe and efficient but

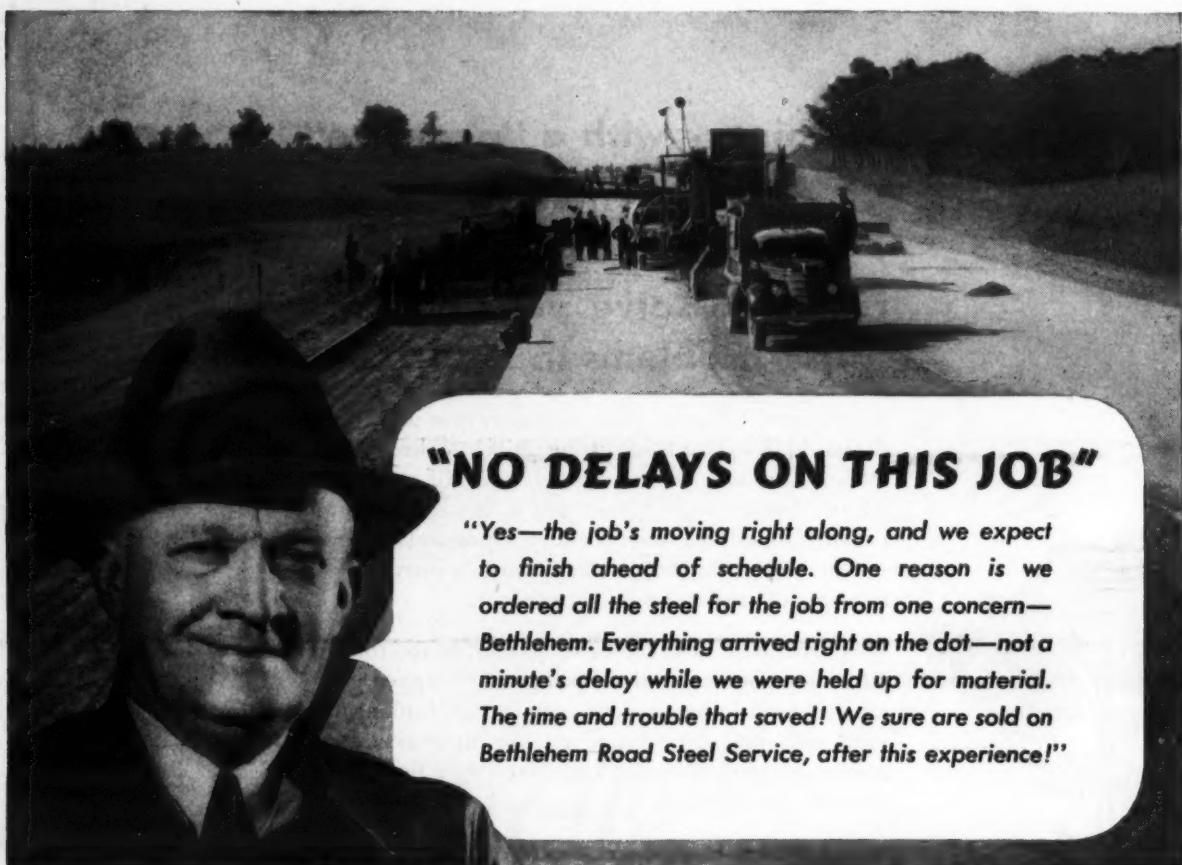
scenically attractive."

"The enactment of the law brings to a successful conclusion more than ten years' struggle by individuals and associations interested not only in good roads but in good government."

"The Legislature will pass upon the type of construction when plans are submitted by the Highway Commissioner and will vote upon the appropriations."

### Ryan Made Sales Mgr. For Southwest Welding

H. J. Ryan has been made Sales Manager of the Construction Machinery Division, Southwest Welding & Mfg. Co., Alhambra, Calif., to direct sales of dirt-moving scrapers, tamping rollers, heavy-duty rippers, bulldozers, dump bodies, and other construction equipment. "Jim" Ryan was formerly connected with the Worthington Pump & Machinery Corp., with his headquarters in St. Paul, Minn., and more recently with the Navy Department, Bureau of Yards and Docks, at Chicago, Ill.



### "NO DELAYS ON THIS JOB"

*"Yes—the job's moving right along, and we expect to finish ahead of schedule. One reason is we ordered all the steel for the job from one concern—Bethlehem. Everything arrived right on the dot—not a minute's delay while we were held up for material. The time and trouble that saved! We sure are sold on Bethlehem Road Steel Service, after this experience!"*

Here's something to think about in planning postwar highway-building:

To keep the job moving fast, contractors can count on Bethlehem to supply all the material and supply it fast. Bethlehem makes all the steel needed to build a highway, street or any type of bridge. When a contractor buys all the steel for a job from Bethlehem he obtains everything he needs on a single order, with most of the items shipped from one of Bethlehem's handy warehouses. The entire order is carefully co-ordinated, handled

as a unit, with shipments scheduled so that he gets each item of steel as he needs it.

It pays—in time, money and trouble saved—to make Bethlehem your headquarters for all the steel products used in building highways, streets, roads and highway bridges.

Bethlehem highway products, listed here, are sturdy and reliable—designed and built for rugged performance. For full information about them, get in touch with the nearest Bethlehem district office, or write direct to Bethlehem Steel Company, Bethlehem, Pa.

## Bethlehem Steel for Highways

ROAD JOINTS • DOWELS • DOWEL BAR SUPPORTS • CENTER STRIP • WIRE ROPE AND STRAND • BAR MATS • BAR TIES • ANCHOR RODS • GUARD RAILS • GUARD POSTS AND BRACKETS • PIPE • HOLLOW DRILL STEEL • DIGGING BARS • STRUCTURAL STEEL • MOLD BOARDS • CONCRETE REINFORCING BARS • BRIDGE FLOOR REINFORCING • CORRUGATED SHEETS • BAR SUPPORTS • TURNBUCKLES • TIE RODS, SPIKES, BOLTS AND NUTS • RIGHT-OF-WAY FENCE AND POSTS • TIMBER BRIDGE HARDWARE • SHEET AND H-BEARING PILING



**HERE'S THAT EQUIPMENT YOU'LL NEED FOR SECONDARY ROADS—**

The swirling, chopping action of the tines does the job

### ARIENS AGGMIXER

For mixed-in-place construction work, on secondary roads, Ariens Aggmixer is equipment designed and built especially for the job—for use wherever aggregates are used, such as all types of bitumens, cements, clay, chlorides, etc. These materials are mixed without being displaced on the road surface. Ariens Aggmixer thoroughly pulverizes, mixes, and aerates almost all types of aggregates with the binder used, doing the job thoroughly, rapidly and economically. It operates in connection with other general purpose road equipment, adjustable to any tractor with simple and positive hydraulic adjustment for depth. Made in 4 sizes with normal cutting widths 4', 5', 6', and 7'. Write for job fact sheets and name of nearest distributor.



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Home Atmosphere combined with Unlimited Facilities . . . Meeting Rooms, Dining Rooms, Entertainment, Shops, Unique Cocktail Lounge.

Private Beach Putting Greens  
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"I never dreamed I'd live to see that on a construction job!"

## County Airport

(Continued from page 1)

were utilized. Some intelligent member of the contractor's organization planted the thought with Sheridan's young people that it was not only patriotic, but smart, to assist in the early completion of the airport, and the acute labor shortage was solved. Girls home for vacation from some of the country's largest colleges, with some graduates, begged for the chance to drive tractors on the job, and when the supply of drivers exceeded the available equipment, some drove gravel trucks. The rolling shifts were adjusted to their convenience: 6 a.m. to 2 p.m., 2 to 10 p.m., and 10 p.m. to 6 a.m.

### Grading

Grading operations consisted of excavating the sites of the new runways and taxiways to a sufficient depth to provide for placing the sub-base material, and the compaction of the underlying 6-inch depth of soil. The contractor used four 25-cubic-yard Wooldridge Terra Cobra scrapers, and one 16 and one 12-cubic-yard LeTourneau, all six units pulled by Caterpillar D8 tractors. Two additional D8's served as pushers, and two Caterpillar D7 tractors pulled the sheepfoot rollers used in compacting the subgrade which was shaped by Caterpillar No. 12 motor graders, seven of which were available on the job. All excavated material was utilized to fill low areas in the vicinity, with an average haul of 800 feet. Production averaged 600 cubic yards per hour.

Field fueling of all prime movers was done from an 800-gallon trailer-mounted tank truck, and a trailer-mounted General Electric arc welder was used for emergency field repairs of all equipment.

While grading was in progress, the contractor used a Parsons 25 trenching machine in placing 13,000 linear feet of Bernico conduit for the underground lighting system. This conduit was laid in 6, 7, and 8-foot lengths with a sleeve connection.

Provision for future extensions of the Sheridan city water works system was made by installing a 30-inch concrete pipe under and across one runway to permit later placing of 8, 10, and 12-inch water mains by the city without disturbing the runway paving. Under this 30-inch concrete pipe, 8-inch vitrified-clay pipe with open bell-and-spigot joints was laid for drainage. To eliminate any possibility of future damage to the paving should the water lines develop leaks, the subdrain lines were extended to a natural open outlet.

### Producing Sub-Base Aggregate

Material for the granular sub-base was available in pits adjacent to the airport where stripping of from 6 inches to 3 feet was done by the same scrapers used for grading. The specified gradation of the material was as follows:

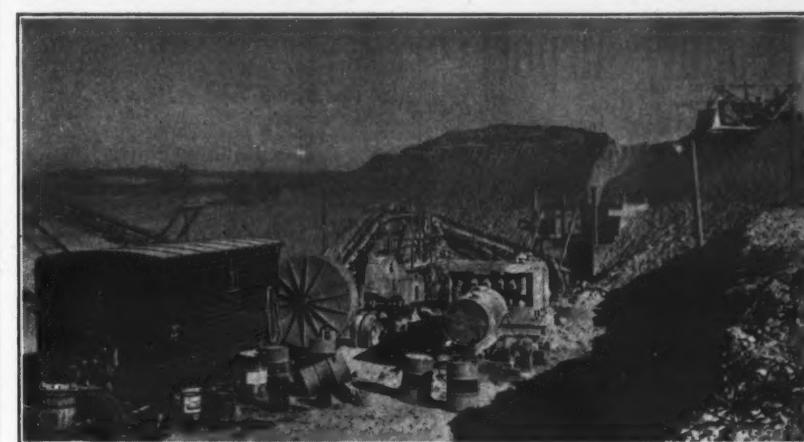
Size of Sieve (Square Openings)	Per Cent Passing
2-inch	100
5/8-inch	55-100
No. 4	35-85
No. 10	25-60
No. 40	10-35
No. 200	3-15

The liquid limit was required to be not

over 25, with a plasticity index not greater than 6. The percentage of material passing the No. 200 sieve could not be more than half of the percentage passing the No. 40 sieve.

The contractor opened two of these pits for the production of granular sub-base during the early stages of construction but later used the second one for producing aggregates for the bituminous surfacing. The material in the pits met the specifications without rejections except that about 35 per cent of it required crushing. The average size of this 35 per cent was from 2½ to 3 inches. A small amount of oversize ranging up to 6 inches in diameter was hand-picked off the feed belts by a man stationed there for that purpose. Specifications permitted a maximum size of 2 inches to be used in the granular base but the contractor found that material with a maximum 1½-inch size compacted more readily so adjusted his plants to produce that maximum at an average rate of 300 tons per hour from each plant.

During part of the operation, Le-



The Cedar Rapids crushing and screening plant in Pit 2 for the production of granular sub-base material and aggregate for surfacing for the Sheridan Airport was fed by the bulldozer shown at the right.

Tourneau scrapers hauled pit-run material to a stockpile beside the screening and crushing plants, and from this stockpile a Caterpillar D7 tractor with a LeTourneau bulldozer pushed the mate-

rial into the wooden bin used to feed the plants. At other times the plants were fed by a 3/4-cubic-yard Northwest shovel, loading to three 2-ton International

(Continued on next page)



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# County Airport

(Continued from preceding page)

trucks for haul to the charging hopper. From these hoppers a 24-inch Pioneer eccentric feeder transferred the material to conveyor belts which charged the Pioneer 48V plant used in pit 1 and the Cedar Rapids plant in pit 2.

The Pioneer plant was belt-driven by a Caterpillar D17000 engine, mounted on a trailer chassis and covered by a house built on its frame to provide a tool house and parts room as well as protection for the engine.

The Cedar Rapids plant, which was subsequently used for the production of aggregates for the bituminous paving, was directly connected to a second Caterpillar D17000 engine, skid-mounted and not housed. This plant produced 200 to 250 tons per hour of the 1-inch maximum-size aggregate with proportionately lower production on the other specifications which required more crushing.

Each crushing plant was equipped with a 5-kw generator for illumination of night operations, and truck-mounted Waukesha 10-kw light plants were used in the pits and on the runways.

Crushed and screened materials from both plants were raised by belt conveyors to 30-ton steel bins from which they were loaded by gravity to the five to eight 5-cubic-yard trucks which hauled the gravel to its place of use.

## Compaction

Because of the sandy nature of the binder in the material available for granular sub-base construction, a great deal of difficulty was experienced in securing the desired compaction. Numerous methods were tried in an attempt to expedite this feature of the work and the following procedure was adopted.

Enough material was truck-dumped into windrows to cover the area to a 5-inch loose depth, and considerable quantities of water were added to the loosely spread windrows. For this operation the contractor provided three 2,300-gallon trailer-mounted tank trucks, discharging by gravity through a 12-foot spray bar. For filling these tanks expeditiously, he erected a 10,000-gallon steel tank on a cross-tie crib near one of the reservoirs of the city water system which was conveniently located nearby. Two 4-inch Gorman-Rupp pumps filled the elevated tank which was equipped with a 6-inch discharge line and a quick-acting valve. By use of this line, discharging into openings in the tops of the tank trucks, it was possible to fill a 2,300-gallon tank in two minutes.

After the initial addition of water, the wet material was thoroughly blade-mixed and placed in parallel windrows 20 feet apart. It was then spread by several Caterpillar No. 12 motor graders and rolled by both sheepfoot and pneumatic rollers, both of which appeared to be essential to proper results. Rolling continued 24 hours a day 7 days a week.

Three McCoy sheepfoot rollers were available for constant use, each consisting of two drums 5 feet in diameter and 5 feet long, each drum with 120 feet  $7\frac{1}{2}$  inches long and having a 2 x 3-inch bearing area. Each dual roller had an empty weight of 8 tons and a loaded weight, used during most of the compacting operations, of 14 tons. They were pulled by Caterpillar D7 tractors.

Twelve pneumatic rollers were used, nine 9-wheel, one 10-wheel, and two 13-wheel, loaded with additional gravel to give the highest bearing pressure that the tires would withstand. A thirteenth pneumatic roller was available for standby use. These pneumatic rollers were pulled in tandem, two behind each of six wheel tractors, two Minneapolis Moline, two International I-9's, and two International Model M's.

As a final finish operation, just before priming, the granular sub-base was

rolled by a Buffalo-Springfield 10-ton 3-wheel roller, two Buffalo-Springfield tandems of 6 to 8 and 8 to 12-ton weight, and two Austin-Western tandems of 8 to 10-ton weight.

## The Hot-Mix Plants

Crusher-run aggregates with 1-inch maximum stone from pit No. 2 were delivered by dump trucks to stockpiles at each of the two hot-mix plants. Caterpillar D7 tractors with LeTourneau bulldozers pushed the material into bottom-gate wooden hoppers from which Pioneer eccentric feeders delivered it to the cold elevators. Asphalt was shipped in tank cars from a refinery at Cody, Wyo., to a siding 2 miles from the plants. At this siding, steam from the power plant of a nearby flour mill was used to raise the temperature, while a Cleaver-Brooks car heater completed the heating to 350 degrees and the transfer to the booster trucks.

Plant No. 1 was a Madsen with a 3,000-pound pugmill. A 72-inch Madsen

(Continued on next page)

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**MODERN WITH**

Size	
1 $\frac{1}{2}$ -inch	
1-inch	
$\frac{3}{4}$ -inch	
$\frac{1}{2}$ -inch	
$\frac{5}{8}$ -inch	
No. 4	
No. 10	
No. 20	
No. 50	
No. 100	
No. 200	
Conventional Bitumen	

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# County Airport

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drier 24 feet long, driven by a 40-hp Westinghouse motor and operated without a dust collector, discharged the dried aggregates to the hot elevator. A 100-hp Westinghouse motor operated the hot elevator and shaker screens, which separated the material into two bins, 1 inch to No. 4, and minus No. 4. When base was being mixed, a 1½-inch screen was substituted for the 1-inch one, while for the "special surface" mix the maximum size was ¾ inch. An unusually large 145-hp horizontal boiler furnished steam for heating the 120 to 150-penetration asphalt, as well as to atomize the drier fuel and to operate the gates of the pugmill. Only one 6,500-gallon tank was available for asphalt storage at this plant, and it was filled from booster trucks driving up a dirt ramp to gain sufficient elevation for gravity discharge. Similar provision was made for replenishing the fuel oil in a 10,000-gallon storage tank. An asphalt pump circulated hot asphalt from the storage tank through a loop which supplied the weigh bucket at the pugmill.

The second Madsen plant, a much earlier model, was erected nearby but was set with a depressed truck drive beneath the pugmill. This plant was served by a similar drier, driven by a Caterpillar D8500 engine, with steam for atomizing the fuel oil from a 100-hp horizontal boiler. A Caterpillar D17000 operated the hot elevator and pugmill, with a 35-hp gasoline engine used to operate the screens, similar to those in the other plant. At this plant a 10,000-gallon insulated steel storage tank was kept hot at all times, and piping was so arranged that its asphalt could feed either plant if necessary. A double-acting steam pump located in an open space in front of the plant pumped from the booster trucks delivering asphalt to this tank, and a second pump delivered asphalt from it to a 6,500-gallon tank elevated enough to provide gravity flow to the asphalt bucket on the mixing plant. Any accidental overflow from the weighing bucket drained back to a 1,000-gallon insulated tank for recirculation. Nearby a 10,000-gallon tank was filled with MC-1 which was kept sufficiently warm to be ready for use at any time for priming the completed base.

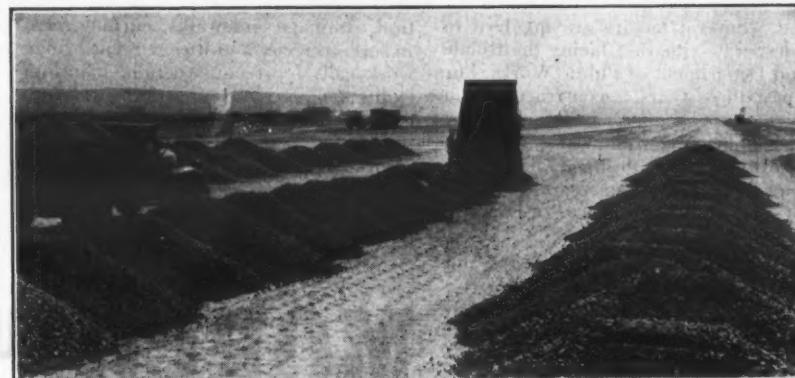
Each plant mixed 3,000-pound batches and four of these were hauled per load in 1½-ton Chevrolet trucks. Ordinarily five trucks were used under each plant and delivered their loads without delay, on a 0.7-mile average haul. When base was ready, mixing was continued day and night, with power from the city system available for illumination at the plant and truck-mounted floodlights, the same type used for night operations on sub-base, lighting the runway paving.

Grading of the three types of asphaltic mixtures used follows:

Size (Square Opening)	Base	Percentage Passing Surfacing	Special Surfacing
1½-inch	100	0	0
1-inch	95-100	100	0
¾-inch	82-100	95-100	100
½-inch			95-100
⅜-inch	60-80	20-90	
No. 4	47-65	55-75	62-79
No. 10	35-50	40-60	45-60
No. 20	24-36	26-44	30-45
No. 50	12-22	15-25	16-27
No. 100	7-14	8-15	9-17
No. 200	3-7	4-8	4-8
Conventional clay	0-1	0-1	0-1
Bitumen	4-5½	5-7	5½-7

One clause in the specifications which entailed some trouble in securing compliance was the following: "Total amount of material passing the No. 200 sieve shall be determined by washing the material through the sieve and not less than half the material passing the 200 sieve by washing shall pass the No. 200 sieve by dry screening".

The object of this clause was, of course, the elimination of a high percentage of minus 200 material occurring as a coating on the larger particles. With



Granular sub-base material was truck-dumped in long windrows on the runways at the Sheridan Airport.

the sandy materials produced from pits available for this work, compliance did not present too serious a difficulty but from a pit where the fine material was largely colloidal it might present almost insurmountable difficulties and is worthy of attention by prospective bidders on any job where the clause is a part of the

specifications.

#### Bituminous Surfacing

When the granular sub-base was properly compacted and thoroughly dried out, it was primed with 0.25 gallon of MC-1 per square yard, applied in 12-foot widths by a Littleford 1,750-gallon

distributor. When this prime was properly absorbed, usually within 24 hours, the bituminous surfacing was placed.

The 5-inch base was laid in two equal courses, 10 feet wide, with the lengths of run usually controlled by the availability of accepted sub-base. Average production was between 200 and 220 tons per hour. One Barber-Greene Tamping-Leveling-Finisher laid the two 2½-inch courses of base, and was also used for the 2-inch surfacing course, or the 2½-inch course of special surfacing. A second Barber-Greene machine, available for standby service, was sometimes utilized when shifting from one location to another to prevent a shut-down of the hot-mix plants. The mixtures were laid at temperatures of 225 to 300 degrees and rolled as soon as possible by the same paving rollers used for the final compaction of the granular sub-base. The joints between adjacent lanes were rolled immediately.

Final sealing of the surface, performed as late in the job as conditions

(Concluded on next page)

# Get the TOUGH Job Ahead!

## GAR WOOD ROAD MACHINERY

WITH ALLIS-CHALMERS DIESEL POWER

When the tremendous after-Victory program of road building and construction breaks, all present indications point to these conditions: 1. An abrupt change back to the pre-war trends of competitive contracting. 2. Ever lower costs will become increasingly important. 3. The profitable business will go to the contractors who use the most efficient methods and machinery.

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Truck-mounted lighting plants aided night work in the pits and on the runways at the Sheridan, Wyo., County Airport.

## County Airport

(Continued from preceding page)

permitted, consisted of an application of 0.30 to 0.35 gallon of RC-2 per square yard and 15 to 20 pounds of cover chips with the following grading:

Size Opening	Per Cent Passing
1/4-inch	100%
No. 4	70-100
No. 10	6-70
No. 40	0-5

The RC-2 was applied at a temperature of 125 to 175 degrees by the same distributor used for priming, and the cover chips through Buckeye spreader boxes.

### Major Quantities

The principal bid items of this contract included:

Unclassified excavation	227,600 cu. yds.
Drain pipe, 8 to 10-inch	336 lin. ft.
Granular sub-base material, in place	162,500 tons
Asphaltic prime coat, MC-1	136 tons
Bituminous mixture for base course	61,800 tons
Bituminous mixtures for surface course	25,860 tons
Asphaltic cement for base and surface courses	4,500 tons
Cover aggregate for seal coating	1,790 tons
3-inch underground duct for lighting system	13,000 lin. ft.

### Personnel

The contract for this runway and taxiway bituminous paving at the Sheridan, Wyo., County Airport, amounting to \$480,845.94, was awarded on July 6, 1944, by the Civil Aeronautics Administration to Peter Kiewit Sons Co., Omaha, Nebr., with 92 working days allowed for its completion. Harvey Johnston was Superintendent for the contractor, and Emil Lehr, Associate Airways Engineer, was CAA Resident Engineer on the project, working under the direction of the Kansas City Regional Office of the Civil Aeronautics Administration.

## Rhode Island Seeks Large Road Program

A program of road construction, reconstruction, bridge repair, and general maintenance to meet immediate needs is planned by Daniel J. Ryan, Director, Rhode Island Department of Public Works. Whether any part of this \$10,636,768 program can be undertaken depends on the action of the General Assembly, but an allocation of \$1,000,000 is asked at once for construction and reconstruction in the next fiscal year.

The program as outlined does not include immediate participation of Federal-Aid money. Approximately half of the total, \$5,300,768, is for work classified as urgent or which cannot be deferred without introducing hazardous conditions leading to costly later repairs. The balance, \$5,336,000, would be used for projects involving roads and bridges which would be inadequate in the future because of such factors as limited width, poor alignment, or the inevitable increase in traffic. The immediate repair of seven bridges which are in critical condition, at a cost of \$44,000, is sought in the interest of safety and the continued use of the structures.

In asking for immediate appropriation of over \$10,000,000, Director Ryan

stated, "Several factors are involved in the desperate situation facing the Rhode Island Department of Public Works. For the past three years, reconstruction and other maintenance have been held to the minimum because of the war emergency. Expenditures have dropped alarmingly in each of the past four years, although labor charges and the prices of material have risen constantly."

"Our present system is antiquated and totally unsuited to meet the certain rise in traffic after the war. As of January 1, 1945, only 51 per cent (418 miles) of state pavements was less than 16 years old, and if another five-year period passes without construction or reconstruction, 82 per cent of the total state highway mileage would be over the 15-year mark. This includes many miles of low-type roads that even now are inadequate for traffic needs and require constant repair and expensive maintenance to keep them in even fair condition for travel."

The "urgent" road work cited by Mr. Ryan calls for 45.1 miles of reconstruc-

tion, drainage, sidewalks, curbing, etc., in seventeen communities. Urgent bridge work calls for reconstruction, painting, railings, underpinning, grouting, riprap, or other maintenance on eighteen spans of the state system. Urgent maintenance embraces twenty drainage systems, replacement of 163,745 feet of guard rail, garage repairs and roofing, and equipment replacement of 2 power graders, 28 trucks, 3 compressors, and 40

sanders.

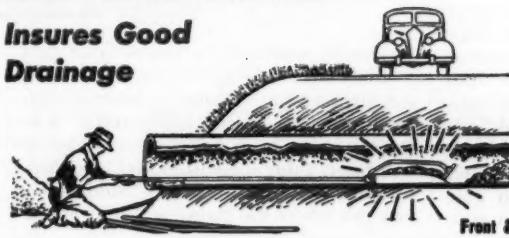
Termed "necessary" in the tentative program is the reconstruction of 70 miles of highway in eighteen communities, repair or reconstruction of thirteen bridges, and construction of new garages for department vehicles and other equipment.

U. S. forces on Okinawa have been giving all they've got to lick Japan. Are you

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A massive earthmoving operation at Point Huemeces, Calif., ready for shipment or invasion to the Seabees.



Rows of International TracTractors with cranes. Duty in the fighting zones will be their next assignment.

Here today. There tomorrow. It's an ever-changing picture, the movement of International TracTractors to the battlefield and on the battlefield.

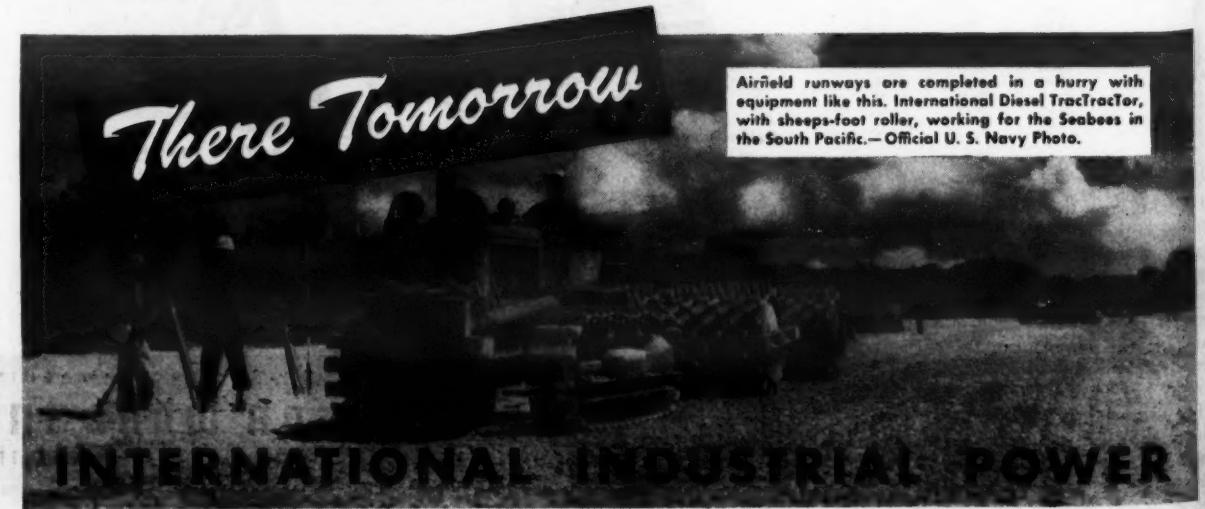
The Navy's Seabees are making history with these big crawlers. Wherever these TracTractors go, manned by Seabees who are skilled in every phase of construction and earthmoving know-how, they are helping speed Victory. Their record is a record of American valor, American planning, American production.

When the war is over and International TracTractors, Wheel Tractors, Engines and Power Units are again plentiful for civilian use, look to this equipment for the answer to your power needs.

These tractors and engines are sold and serviced by a nation-wide International Industrial Power Distributor organization.

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Airfield runways are completed in a hurry with equipment like this. International Diesel TracTractor, with sheep's-foot roller, working for the Seabees in the South Pacific.—Official U. S. Navy Photo.



INTERNATIONAL INDUSTRIAL POWER

## Friction Material for Use On Shovels and Tractors

A well prepared 70-page industrial catalog with an equipment index arranged according to manufacturer and machine has been prepared by the Raybestos Division of Raybestos-Manhattan, Inc., Bridgeport, Conn., under the title "Raybestos 1945 Friction Material for Industrial Use." The illustrated bulletin covers shovel and crane equipment, tractors and other construction machinery, and contains diagrams showing the location of friction materials, descriptions and illustrations of the Raybestos products provided for these locations,

and complete dimensions and catalog numbers for the convenience of equipment superintendents and officials.

Copies of this bulletin are available to readers of CONTRACTORS AND ENGINEERS MONTHLY responsible for installing friction material on construction equipment. Write direct to the manufacturer and mention this news item.

## Straight Highways For Landing Strips

Because so much of Colombia, South America, is either mountainous or jungle, straight sections of road in the new highway construction program are to be

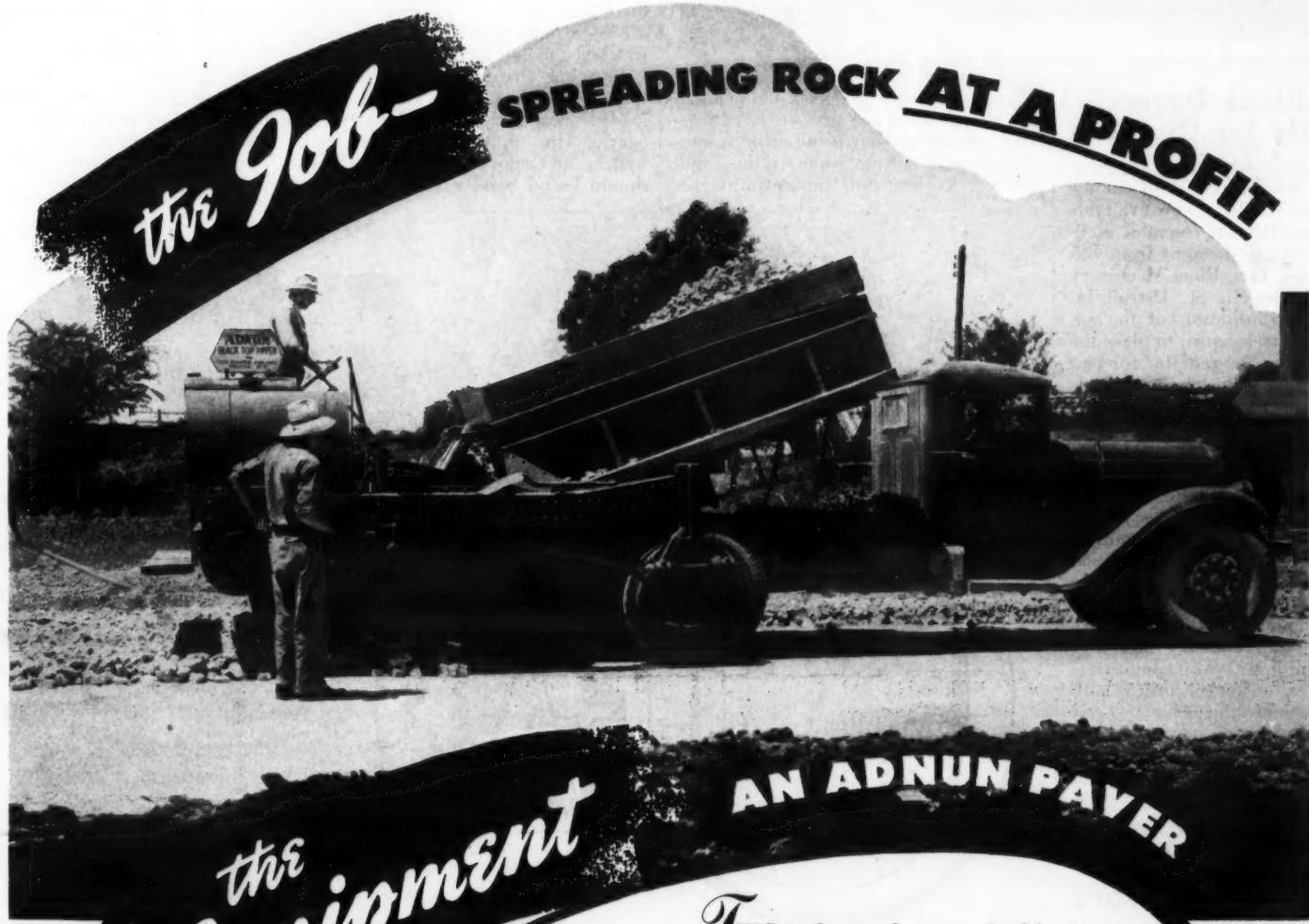
prepared as emergency aviation landing fields. Plans call for marking such stretches of road, moving overhead wires away from the sides, and instructing motorists to be on the lookout for planes which may be landing. These sections of highways will be indicated on both highway and airway maps.

A program of Flight Strips where the plane landing areas would be adjacent to the highways and not on them would eliminate the hazard of mixing up swift airplane traffic and the slower moving highway traffic which could not be cleared from the highway quickly enough to permit the landing of a fast plane.

## Secondary F-A Roads

### Backed by Grangers

The National Grange is calling upon all organized farm groups to take active community leadership in carrying forward the secondary-highway improvement program authorized by the Federal-Aid Highway Act of 1944. Albert S. Goss, Master of the National Grange, has suggested to local Grange leaders that they hold panel discussions in cooperation with local highway officials to secure the "public understanding and participation needed in planning the orderly development of a long-range farm-to-market road system".



**T**HIS is the modern, profitable way to put down rock on highways and airports. Well over 100 tons an hour is an easy average with an Adnun while some owners report 190 tons per hour possible output. Of equal importance, is the fact that the rock is laid right to specifications, even courses free from voids and irregularities, accurate to a small fraction of an inch. No material is wasted and there's no need for raking or excessive hand labor.

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After you have spread the base, the same Adnun will put on the black top without making any changes in the machine. Get the facts on this versatile contractor's tool now and be ready to underbid any competition and still make good profits.

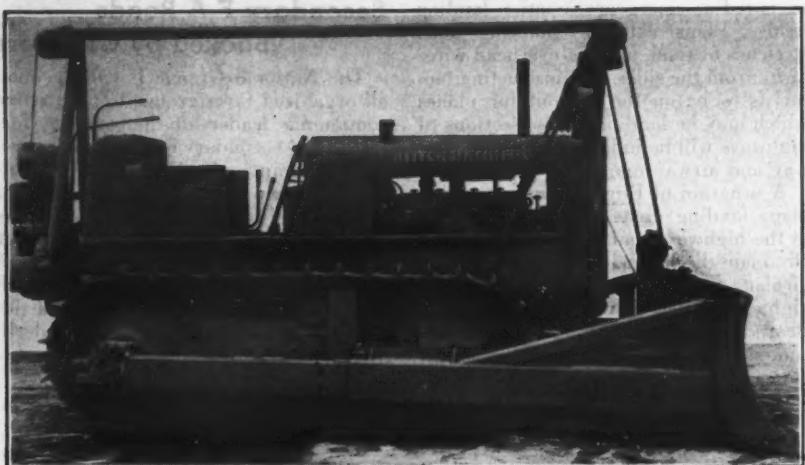
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**BLACK TOP PAVER**

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BUILT BY THE MAKERS OF  
MULTI-SURFACE CONCRETE PAVERS



A Gar Wood Dozecaster mounted on an Allis-Chalmers tractor.

### Angling-Blade Dozer Ready for Civilians

The Gar Wood cable-controlled Dozecaster, which has proved itself on the world's fighting fronts, is now available in limited quantities for essential civilian use, according to a report from Gar Wood Industries, Inc., Road Machinery Division, 7924 Riopelle St., Detroit 11, Mich. This new bulldozer, of the angling-blade type, is designed to place the moldboard close to the radiator for better balance and easier pushing. It is mounted on an Allis-Chalmers HD-14 diesel tractor.

Tilting of the moldboard is achieved by a double trunnion on the main frame which eliminates the need for a tilting mechanism on the moldboard itself. This takes weight from the front and contributes to better balance. There are no screw thread adjustments. The cable sheaves are of steel, hardened in the grooves and mounted on hardened and ground shafts with roller bearings. For operating this unit, Gar Wood Industries offers its own cable control unit in both single and double-drum types.

Complete information regarding the availability and price of the Dozecaster may be secured direct from the manufacturer.

### Flammable Solvents Are Constant Fire Hazard

The yearly toll in life and property resulting from explosions of flammable solvents could be greatly reduced by observing all possible precautions in storing and using gasoline, naphtha, benzene, and acetone in accordance with the National Fire Protection Code. Some of these precautions are obvious; others may not be so apparent unless continual attention is called to them.

Small quantities of flammable solvents can be as dangerous as larger quantities. Such liquids should be kept in approved safety cans, and before using it should be ascertained that there is no danger of ignition from flames, or mechanical or electric sparks. Electrical equipment should be in explosion-proof enclosures, in accordance with the National Electrical Code; non-sparking bronze tools should be used; and workers should be provided with shoes made without nails. High temperatures due to fire or friction are a source of danger.

Where large quantities of flammable

solvents are stored or used, more intensive precautions are necessary. Disastrous explosions can result from a concentration of solvent vapor in the atmosphere. To keep this concentration be-

low the lower explosive limit, use equipment that will minimize the escape of the vapor into the air and neutralize such vapor as does escape by natural or mechanical ventilation. In any case, the vapor content in the workroom air should be kept below the maximum allowable concentration for continuous exposure, not only as protection against explosion but to prevent absorption to the point of toxicity.

Good ventilation alone, however, is not sufficient where localized fire hazards exist. The ignition of spills, creeping vapors which may travel 100 feet or more from the point of origin, vapors collected in low places such as pits or basements, and explosive vapor-air mixtures that remain in emptied containers are conditions which must be constantly watched for and guarded against.

Portable fire extinguishers, of the foam, vaporizing-liquid, carbon-dioxide, loaded-stream, or dry-powder types, and bearing the approval of the Underwriters' or Factory Mutual Laboratories, should be on hand wherever flammable

solvents are stored or in use. Open tanks of such solvents require a built-in fire extinguishing system. In all cases, workers around this type of hazard should be thoroughly trained in fire-fighting techniques and in the maintenance of safety precautions. Needless to say, smoking should be prohibited in such areas.

### Hydraulic-Control Hose and Coupling

Hydraulic hose assemblies such as are used on various types of road machinery, snow plows, material-handling equipment, and dump trucks, for the control of their operation, are described and illustrated in detail in Catalog No. 44 issued by the Anchor Coupling Co., Inc., 342 No. 4th St., Libertyville, Ill., manufacturer of industrial hose couplings and fittings and fabricator of coupled hydraulic flexible hose assemblies.

Copies of this catalog may be secured promptly by addressing your request direct to the manufacturer and mentioning this review.



Gardner-Denver S-73

Gardner-Denver S-55

### HOLE CLEANING! That's the real test of a sinking drill.

Exceptional hole cleaning ability is a "must" feature of Gardner-Denver Sinkers. In hard or soft ground, they keep the hole clean . . . permit faster footage per shift. Open the blower valve, and a powerful stream of air under full line pressure blasts every bit of material out of the hole . . . fast.

Gardner-Denver Sinkers are easy riding . . . perfectly balanced to assure the easy holding that cuts down operator fatigue. From the 31-pound S-33 to the 80-pound S-79, Gardner-Denver Sinkers help speed job progress.

\* \* \*

For complete information on Gardner-Denver Sinkers,  
write for descriptive bulletins.  
Gardner-Denver Company, Quincy, Illinois.

**GARDNER-DENVER** Since 1859



## Georgia Counties Plan Improvements

**Three Counties Forming Southeast Corner of State Have 6-Year Plan Sufficiently Flexible to Permit Speeding or Retarding Completion**

BRANTLEY, Camden, and Charlton Counties form the southeast corner of the state of Georgia. They are located on the coastal plain and approximately 90 per cent of the land area is in forest. With the aid of the Public Works Panel of the Agricultural and Industrial Development Board of Georgia, these Counties have prepared a scheduled program of proposed public improvements, assuming 50 per cent Federal and/or state aid. The construction of the projects will be largely dependent on the actual aid furnished. A period of six years has been selected as being within reasonable prediction for revenues and expenses as well as for needed public improvements. A long-range program has been prepared to avoid large immediate expenditures of money and undue burden on the taxpayers.

The schedules have been set up with the idea of developing first those projects which are most urgently needed. It is expected that circumstances may alter the priority of needs in the respective counties and towns. For this reason the program will be revised annually and continuously extended to maintain a constant six-year period. The program is a flexible one which can be put into effect over a shorter or longer period of time, depending on economic and local conditions.

The land area in Brantley County is 447 square miles, in Camden County 656 square miles, and in Charlton County 799 square miles. Brantley County's population in 1930 was 6,895, as compared with 6,871 in 1940. Camden County's population in 1920 was 6,969 as compared with 6,338 in 1930 and 5,910 in 1940. Charlton County's population in 1920 was 4,536 as compared with 4,381 in 1930 and 5,256 in 1940.

### Brantley County Program

The scheduled proposed public improvements in Brantley County comprise chiefly road construction, drainage, and the construction of an airport. In the years 1945 through 1947 it proposes the expenditure of \$66,000, 50 per cent Federal and State Aid, for the construction of a road 17.4 miles long from Buffalo Creek via Nahunta to Georgia 121. The expenditures in the three years would be \$16,000, \$8,000, and \$9,000 respectively. Also in 1946 it plans the construction of a central garage at Nahunta for repairing county-owned equipment, at a cost of \$8,000. In 1947 the construction of an airport with sod landing strips, at a cost of \$9,000 to the County, is planned, the total cost being \$18,000 and the balance to be made up from Federal and state funds.

The 1948 project is the expenditure of \$12,500, plus 50 per cent Federal or state aid, for the construction of a health center at Nahunta, the county seat. In 1949 it is planned to spend \$19,000 of county funds plus 50 per cent Federal and State Aid for the construction of 9 miles of road from Hickox to Burnt Fort Road, thence south to the Charlton County line. In 1950 the County plans to spend \$6,500, plus 50 per cent aid, for the construction of an addition to the courthouse. In that same year, it is planned to spend \$8,000 of county money to start a \$38,000 project to build 9.3 miles of road from Waynerville to the Wayne County line. Plans for work after 1950 include the construction of drainage canals in the Nahunta area, the construction of a recreation center at Nahunta, the construction of 9.2 miles of road paralleling Georgia 50, and 9.3

miles of road from Atkinson south to the Camden County line. Total county expenditures for these projects are expected to be \$161,000.

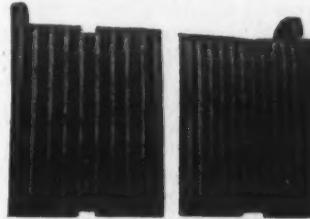
### Camden County Plans

The anticipated work in Camden County totals \$230,000. It includes, in 1945, the expenditure of \$18,000 of county money plus 50 per cent aid for 12.9 miles of road from White Oak via Tarboro to Burnt Fort and \$8,000 for the construction of a central garage for repairing county-owned equipment. The two projects for 1946 include \$9,000 of county money with 50 per cent Federal and state aid for the construction of an airport with sod landing strips, and \$17,000 plus 50 per cent State Aid for 8.4 miles of road from St. Marys to Elliotts Bluff. The 1947 project is \$12,500 for the improvement of the courthouse and jail, with \$18,000 of county money also in this year, plus 50 per cent State Aid, for the construction of 15.1 miles of road from Waverly to Dover Bluff;

(Concluded on next page)

# Crushes 4900 tons!

WHERE FORMERLY 1800 TONS HAD BEEN THE LIMIT!



WHEN your crusher jaws become seriously worn, don't think of throwing them on the scrap pile. Instead, save yourself the trouble of a costly replacement and an annoying shut-down by doing what one company does—and that is to hard-face worn crusher jaws with wear-resistant Coast Metals.

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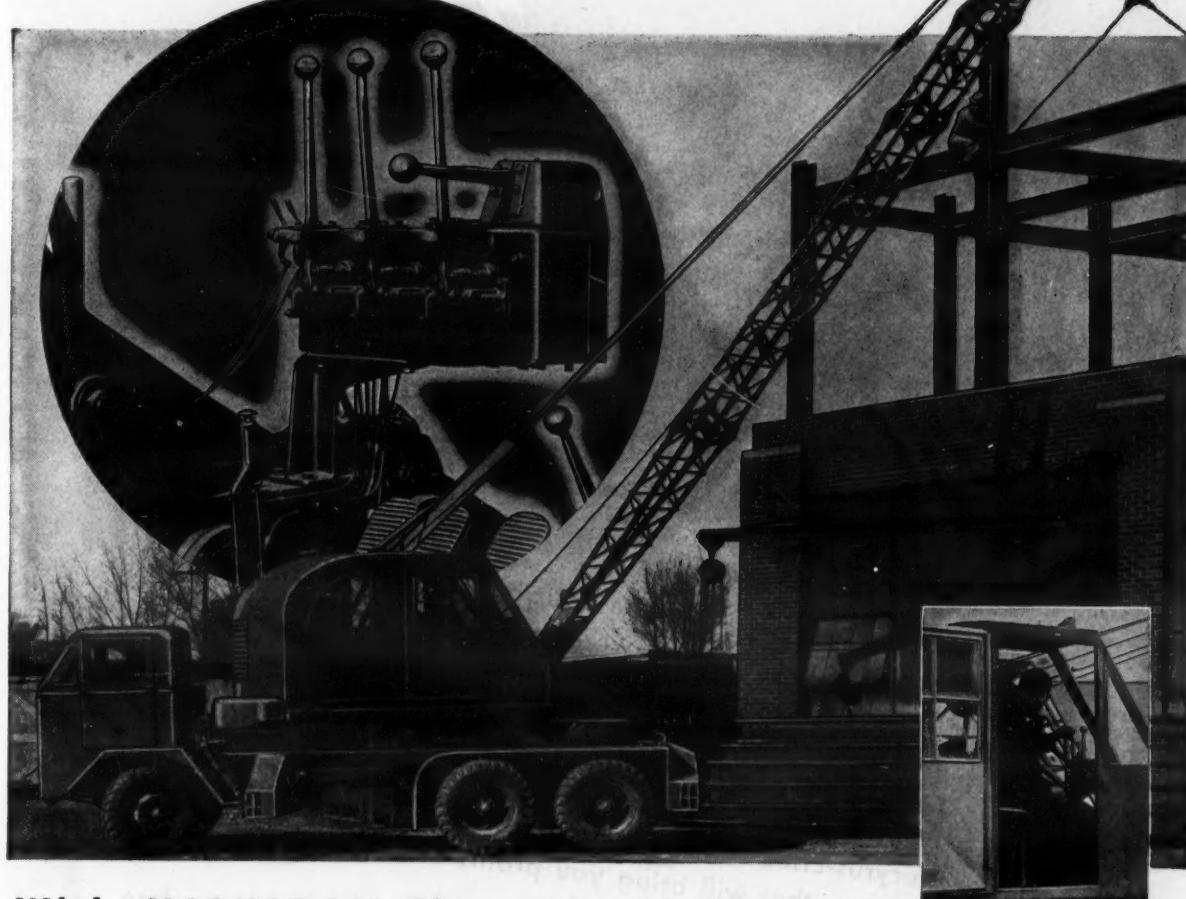
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Controls are job-proven, both in civilian and in military use . . . . Unsurpassed operating speed and truck mobility, plus real stamina and balanced design, are combined in the shovel-crane that has proven "tops" in materials-handling.

3/8 yd. and 1/2 yd. shovels—convertible to crane, clam, dragline, trench hoe. 6, 10 and 12 ton cranes.

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**MICHIGAN**  
POWER SHOVEL COMPANY  
BENTON HARBOR, MICHIGAN

## Georgia Counties Plan Improvements

(Continued from preceding page)

\$27,000 is planned for this same project the following year.

The two 1949 projects in Camden County are \$24,000 of county money, plus 50 per cent State Aid, for 9.05 miles of road from U. S. 17 to Harriets Bluff, and an initial expenditure of \$5,000 on a \$68,000 project, including 50 per cent State Aid, for 13.9 miles of road from U. S. 17 to the Brantley County line. An additional \$29,000 of county money would be expended on this in 1950. The two projects planned for construction after 1950 include \$12,500 for a health center at Woodbine with 50 per cent Federal and state aid, and \$50,000 for resurfacing of county roads.

### Work in Charlton County

The Charlton County public-improvements schedule totals \$136,650. It starts out with \$17,000 of county money, plus

50 per cent State Aid, for 11.8 miles of road in 1945 from Burnt Fort to Folkston. In the same year \$3,000 would be expended, plus 50 per cent Federal aid, for the development of Homeland Park. In 1946 the expenditure of \$25,000, plus 50 per cent State Aid, is planned for 21.9 miles of road from Winokur to Prospect Church. The two 1947 projects include \$7,500 for a central garage, and \$12,500, plus 50 per cent Federal and state aid, for the construction of a health center at Folkston.

In 1948 Charlton County plans to spend \$2,650, plus 50 per cent Federal aid, for the improvement of its airport, including the extension of runways and the installation of a wind cone. In the same year its share in the construction of 9.9 miles of road from Georgia 185 to within 0.5 mile of the Florida line would be \$17,000, plus an equal amount of State Aid. The expenditure of \$19,000, plus 50 per cent State Aid, is planned for 1949 for 14.0 miles of road from Winokur to the Brantley County line. The two projects scheduled for

1950 include \$15,000, plus 50 per cent State Aid, for 8.2 miles of road from Georgia 185 to the Florida line, and \$5,000, plus 50 per cent State Aid, for 6.0 miles of road from Winokur to Racepond. The single project scheduled for later construction amounts to \$13,000, plus 50 per cent State Aid, for 5 miles of road from Folkston to Paxton.

## Catalog on Wire-Rope And Chain Fittings

The first industrial and marine hardware catalog published by Thomas Laughlin Co. of Portland, Maine, since 1942 has recently been issued as Catalog No. 135. It illustrates, describes, charts, and lists prices on all available items.

Typical of the engineering data included is a comprehensive chart giving the fourteen vital dimensions of hoist hooks, specifying by hook number the safe load and proper size for proof-coil and BBB chains, plow-steel and improved plow-steel wire ropes.

Similar charts cover swivel hooks,

turnbuckles, jaws, eyes, shackles, closed wire-rope sockets, and open wire-rope sockets. Another chart, never before published, gives comparative rope strength with recommended turnbuckle size and type for each size of rope.

This new catalog is indexed in detail, and may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to the manufacturer.

## You'll Find Special Advantages in Every DIXON Product

Patented features of design and construction incorporated in DIXON hose couplings, nipples, menders and clamps, assure important service benefits in every application. The products listed below provide typical examples.



### "KING" COMBINATION NIPPLE With Patented "Cor-O-Zig" Corrugations

Made from malleable iron or brass, with two-way "Cor-o-Zig" corrugations and two lug wrench stops. Widely used in place of regular iron pipe nipples. Sizes:  $\frac{1}{2}$ " to 8", inclusive.

**ADVANTAGES**—Designed to fit straight end hose (without enlarged ends), and can be readily reset when necessary. Easier to insert in hose, because of spiral corrugations on end portion. Greater holding power under clamp pressure by reason of zig-zag corrugations on other half of shanks, which also prevent nipple from turning in hose.



### "KING" Single and Double Bolt CLAMPS

The strongest clamps of their kind, and easiest to attach. Bolt lugs are heavily reinforced, while tongue and ears for vice jaws, are full width. Single bolt sizes fit hose from  $\frac{3}{4}$ " to  $5\frac{1}{4}$ " O.D.; double bolt,  $3\frac{1}{2}$ " to  $17\frac{1}{4}$ " O.D.

**ADVANTAGES**—Perfect conformance to hose periphery, with broad bearing surface, insures equally distributed compression when clamps are tightened, without cutting into hose cover and carcass. Double bolt style has quadruple take-up, providing exceptional gripping power.

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**Output Makes 'Em  
Fighters!**

A  $\frac{1}{2}$ -yard 15-t load trucks on a Southwest Pacific airport job.  
*(Signal Corps Photo)*

Always built to handle tough assignments, Bucyrus-Erie excavators were ready for their role in a two-fisted dirt moving war. That's why they're making such an outstanding performance record on every fighting front and at home. Behind the big output that makes wartime Bucyrus-Eries real fighting excavators are these features that will bring you profits in peacetime:

- 1 Independent positive twin-rope crowd.
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- 6 Independent boom hoist.
- 7 Oil enclosed gears.
- 8 Field-developed dippers, tiger teeth.

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# Acetylene Generators And Their Operation

## Some Helps and Hints That Will Aid Shops to Operate And Care for Generators In Best Possible Manner

A VERY interesting bulletin containing much helpful information for welding and cutting operators, which was prepared primarily for the benefit of shipyard employees by the United States Maritime Commission, is equally applicable to any plant or shop using one or more acetylene generators. This bulletin, No. 23 in the series of Shipyard Health and Safety bulletins, is entitled "Good Practices in the Operation of Acetylene Generators", and is divided into two parts: Good Practices, and Caution.

### Good Practices

All acetylene generators should be of a type which has been tested and listed by Underwriters' Laboratories, Inc., Chicago, or Factory Mutual Laboratories, Boston. The generator must be installed in accordance with recognized good practice which is in conformity with the standards of the National Board of Fire Underwriters or Factory Mutual Laboratories and local and state regulations.

Generators must always be operated in accordance with the printed instructions supplied by the manufacturer with the generator. Acceptance and approval by Underwriters' Laboratories, Inc., or Factory Mutual Laboratories are contingent upon the operation of the generator in accordance with these instructions which should be conspicuously placed in the generator room where they can be read easily.

Only the size of carbide for which the generator is approved and marked should be used. The size marked on the drum must be the same size as that specified on the name plate of the generator. A check should be made by the Safety Engineer, from time to time, to make certain that the specifications for carbide are being followed.

The water used in an acetylene generator must not contain salt or other corrosive material, anything that gives rise to excessive foaming, or any solid matter.

The total hourly acetylene output of a generator must never exceed the rate for which it is approved and marked. The rate specifications are always given on the name plate. The minimum time that a generator should be operated on a full charge of carbide may be calculated by multiplying the number of pounds of carbide in a full charge by  $4\frac{1}{2}$  (the number of cubic feet of acetylene yielded per pound of carbide) and dividing this by the maximum total hourly acetylene output permitted in cubic feet, as marked on the generator name plate. For example: if the generator holds 500 pounds of carbide and the maximum total hourly acetylene output is 1,000 cubic feet, the minimum operating time for a full charge of carbide will be  $2\frac{1}{4}$  hours.

Only fully trained and competent em-

## COMPLETE WELL POINT SYSTEMS

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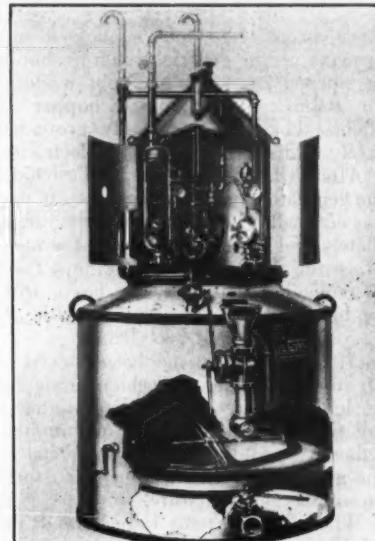
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ployees should be permitted to operate acetylene generators. Their training should be under a qualified supervisor who should fully satisfy himself that the men understand the operation of the equipment and the safe practices necessary to prevent accidents. It is strongly urged that men who are put in charge of acetylene generators be examined as to their knowledge before they are given the responsibility of operating them.

Generators must be maintained in accordance with the recommendations of the manufacturer and must be inspected periodically to insure that all parts are in proper working order and that there are no leaks. The inspection should be supervised and witnessed by a qualified supervisor. Maintenance instructions



Courtesy, Oxy-Acetylene Tips  
A typical medium-pressure acetylene generator, sectioned to show its interior mechanism.

should be kept accessible for ready reference. The recommendations of the generator manufacturer regarding the various types and frequency of inspection must be strictly followed.

Periodic inspections must be made of the interior of the generator, and any solid accumulations removed. The medium-pressure generator relief valves should be regularly inspected to insure proper functioning. The relief valve on the generating chamber should be set to "blow" at a pressure not in excess of 15 psi.

Only those repair or replacement parts supplied by the manufacturer of the generator should be used. No modification, such as the removal or addition of parts or equipment, unless recommended by the manufacturer, should be permitted, as such changes will render the generator substandard and void the approval of Underwriters' Laboratories, Inc., and Factory Mutual Laboratories. Such modifications, which are intended as improvements, may actually intro-

(Continued on next page)



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## Acetylene Generators And Their Operation

(Continued from preceding page)

duce some hazard which is not apparent. Whenever repairs are to be made, or whenever carbide is to be charged into or removed from the generator, the water chamber must be kept full to maintain at a minimum any air-acetylene mixture within the water chamber and also to prevent the dropping of carbide particles onto a damp surface. Previous to making any repairs involving welding, soldering, or other hot work, or any operation likely to produce ignition, the generator must be disconnected from the piping system; the carbide charge and feed mechanism removed, where this is necessary to prevent their becoming wet; and all acetylene completely expelled by flooding the generator with water. The generator must be kept filled with water so far as work permits, positioning it so as to hold as much water as possible.

Hot repairs must be made outside of a room where other generators are installed; preferably outdoors.

### Cautions

The presence of unauthorized persons in or about the generator installation or room should be prohibited. Portable lights, including floodlights, should not be used in or about the generator house. Open flames, smoking, or matches should not be permitted even though the generator is not in service. Use only soapsuds to locate leaks.

In the operation of generators, it is important that the attendants have sufficient time to perform their duties properly. Haste in recharging may lead to oversight or improper procedures that may result in an accident. In recharging, it is essential that the residue and water be drained, the generating chamber flushed with water, and fresh water supplied to the generating chamber before refilling the hopper with carbide. Failure to drain the residue each time the charge of carbide is added will cause undesirable operating temperatures, which may result in localized areas of incandescent carbide. Failure to fill with fresh water before charging with carbide may result in carbide being fed onto the wet generator bottom with heating of the carbide to incandescence.

Before draining the residue and water from a generator, a test should be made, in accordance with the recommendations of the manufacturer, to make sure that there is no carbide left in the generator hopper. This will avoid the possibility of feeding carbide with insufficient water in the generator.

Residue pits should be of the open type or well ventilated to avoid accumulation of air-acetylene mixtures. The residue drain valve should be visible at all times so that any leakage may be observed by the attendant. Leakage of water from the generating chamber may result in a dangerously low water level.

Never under any circumstances should carbide be added to the hopper of a generator while residue is being drained from it. The draining and flushing should always be completed and the generator refilled with fresh, cool water to the proper level before any carbide is added.

Only wooden shovels or scoops should be used for handling carbide. The carbide added each time the generator is recharged should be sufficient only to refill the space provided for carbide without ramming the charge. No metal tool should be used in distributing the charge, as it may create a spark at a time when the generator contains an air-acetylene mixture.

Carbide drums should be opened just before their contents are transferred to the hopper and the transfer should be

made promptly. Only enough drums to make up the generator charge should be opened in order to avoid wasteful air slaking. The charging hopper or chutes should be effectively grounded safely to discharge any static electricity.

After filling with water and carbide, the generator must be purged of air that has entered. This should be done immediately and in accordance with the manufacturer's instructions. It is important to remember that acetylene has a wide explosive range when mixed with air (2.5 to 80 per cent acetylene).

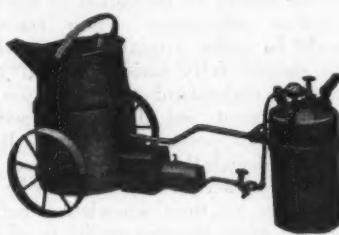
After a generator has been purged of air, the carbide feed mechanism should be left in operating position so that a positive pressure will be maintained. Otherwise, cooling of the acetylene in the generator may draw in air to form an air-acetylene mixture.

When the generator is recharged, the generator hydraulic back-pressure valve must be properly filled with water. Insufficient water may allow a flashback to enter the generator.

(Concluded on next page)

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Use this CONNERY oil-burning Patrol Patching Heater on the small job and this CONNERY oil-burning kettle for large-quantity production.



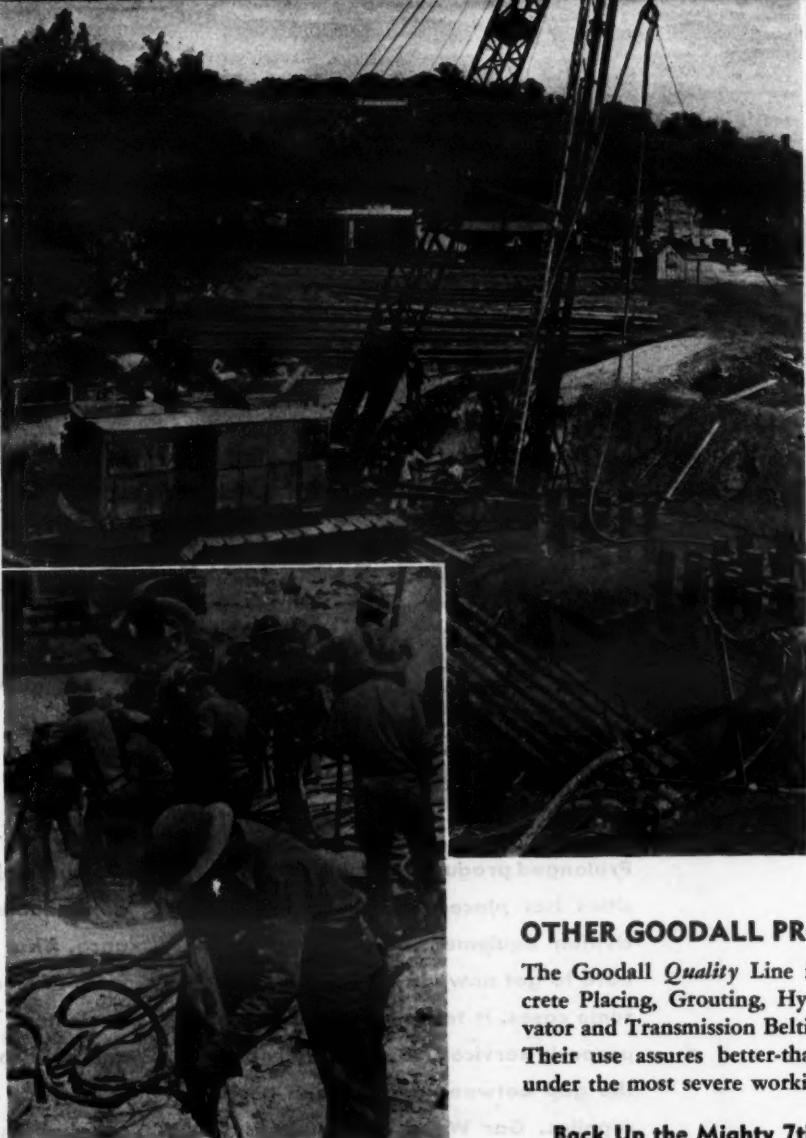
Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring pots, etc.

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**GOODALL** Contractors' Hose has everything it takes to stand the hard knocks and rough wear that go with general construction and roadbuilding service. Every length is made to job-tested specifications . . . from 75 years of experience in meeting the industry's progressive needs.

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A type for every kind of work, above ground or below, in both moulded and braided and wrapped duck constructions. Some are all-Synplastic. "Subway," "Mine King," "Allgood Cord" and "Oil King" are brand names well-known wherever air hose is used.

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Surplus-property disposal.

## Generator Care

(Continued from preceding page)

Service-line shut-off valves must be installed on the discharge side of hydraulic back-pressure valves. A hydraulic back-pressure valve does not function as a service line shut-off valve; gas may seep back from the service line and force water from the hydraulic seal.

### Changing Shifts

Once an attendant has started the recharging of a generator, he should carry through to completion the entire cycle of the recharging operations. If this is not possible because of a change in shifts, the oncoming attendant must determine the condition of each of the generators before taking over from the previous attendant. He should not take anything for granted. If recharging of a generator has been started but not completed, the oncoming attendant should ask the previous attendant specifically what part he has done. If he has any doubt whether the generator is filled with water, he should check the water level himself before checking to determine whether the carbide charge is completely exhausted or before charging carbide into the hopper. Unless the attendant is fully informed, he might, for example, assume that the generator had been drained of residue and refilled with water; whereas it may only have been drained of residue. The adding of carbide to the hopper at such a time would create a condition whereby carbide might be fed onto the damp bottom of the generator and possibly become incandescent because of insufficient water. Accurately kept, detailed operation logs are helpful and recommended, but entries must be made promptly on the completion of each operation.

Should any unusual happening, such as overheating or failure of a mechanism to function, occur during the operation of a generator, extreme care must be used in investigating the cause or in making repairs. The service-line valve should be closed to isolate the generator from the system. In case of overheating, no valve should be opened and no cover plate should be removed that would allow air to enter the generator. The entrance of air under such conditions may result in an air-acetylene mixture that may be ignited by the abnormal heat. The manufacturer should be consulted promptly.

### Freezing

Generator rooms should always be warm enough to prevent freezing of water. If freezing temperatures ever occur, it must be made sure before the generator is operated that the water in the generating chamber and in the hydraulic back-pressure valve is not frozen. Even thin ice on the surface in the generator may prevent adequate contact between the carbide and the water and cause local overheating. Likewise, freezing of the water in the hydraulic back-pressure valve or freezing of the moisture in the pressure relief valves on the hydraulic or on the generator may prevent proper functioning of these devices. If there is any indication that

freezing has occurred, the carbide feed should be locked and the service line closed on all generators so affected. The manufacturer's recommendations should be followed in thawing the generators. The generators must be tested for leaks and all parts must be completely thawed and in good operating order before the generator is returned to service.

—Reprinted by courtesy of Oxy-Acetylene Tips.

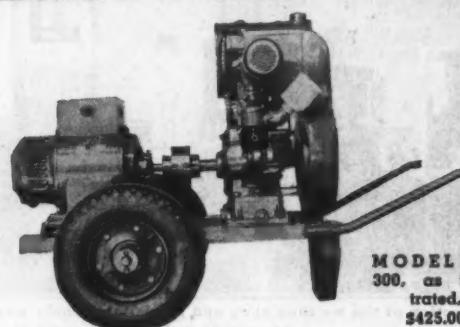
### Hyster Appoints Roach Factory Representative

The appointment of James A. Roach as factory representative has been announced by the Hyster Co., Portland, Ore., and Peoria, Ill. Mr. Roach will cover the Atlantic seaboard states and maintain headquarters in the Hyster New York office at 90 West Street. He was formerly connected with the Mercury Mfg. Co. in Chicago and has had several years' experience in the construction business in addition to his engineering training and materials-handling background.

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MODEL DC  
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Floodlights and portable poles.

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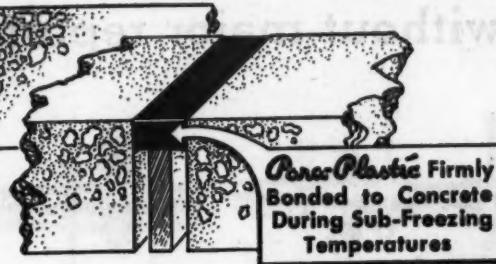
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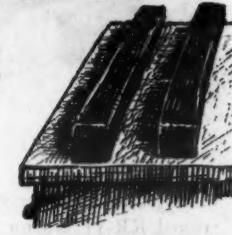
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1.



2.



3.

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- 1 — PARA-PLASTIC Compound Frozen in Solid ICE.
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- 3 — In few Minutes—RESUMES Normal SHAPE.

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A section of the welding shop and laboratory where Eutectic rods are tested, and which is open to welding rod users at any time.

### Shop and Laboratory For Welding Studies

A model welding shop and testing laboratory are maintained by the Eutectic Welding Alloys Co. at its home office, 40 Worth St., New York 13, N. Y. The welding shop has all the necessary equip-

ment for electric arc, carbon arc, and oxy-acetylene welding, gas flames and furnaces. The shop, under the supervision of H. V. Kough, a welding specialist, is used by the company to test random samplings of its welding rods and fluxes in order to assure their quality.

This centrally located laboratory and shop are very much in demand by Eutectic customers. The laboratory, besides containing the usual chemical reagents for the testing and etching of welds, has facilities to determine the tensile strength of welded joints, the transverse tensile strength of all-weld metal as well as the hardness of welds and parent metals. Welding rod users and their representatives are always at liberty to weld and test Eutectic welding rod alloys at this shop and laboratory.

### Modern Mileage Makers

This is the title of a new 8-page illustrated folder issued by the Caterpillar Tractor Co., Peoria, Ill., for the highway engineers and construction men who are already thinking about post-war highway work. A Caterpillar diesel D7 tractor on a road-relocating job, a diesel D6 bulldozer with tractor at work removing a blind corner at a busy intersection, and a Caterpillar diesel DW-10 wheel tractor pulling a scraper, operating as a high-

speed hauling unit, are among the many illustrations.

Highway engineers and contractors can secure copies of this booklet by writing direct to the company for Form 8927. Please mention CONTRACTORS AND ENGINEERS MONTHLY.

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Keeps Diesel Engines  
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TESTS FUEL INJECTORS  
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At Pressures Up To  
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To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

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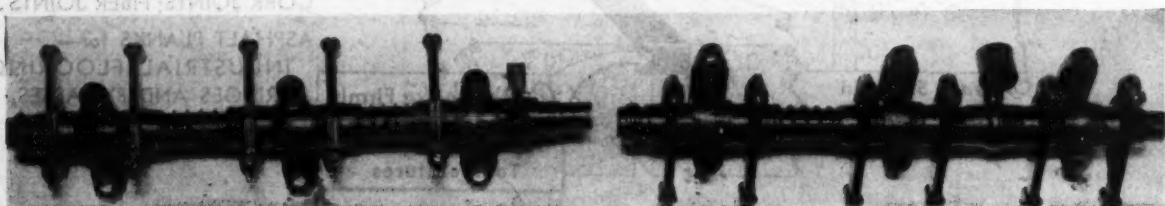
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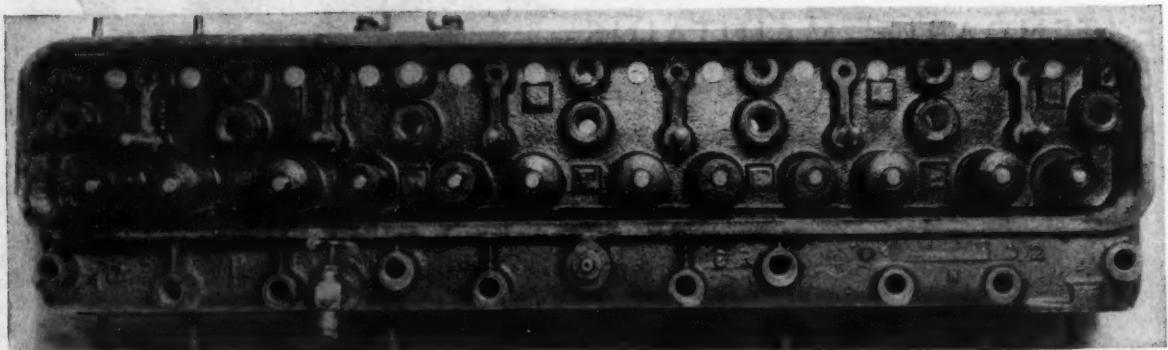
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The pictures tell the story. They're parts from an International KR-11 Tractor on a 5400 gallon fuel transport as they came from the engine after 118,000 miles operation. Rocker arms (top) and cylinder head (middle) are nearly as clean as when they were installed. Pistons (above) had no varnish deposits, rings were free and oil ring slots open.

Mr. John G. Steger, Manager of the Terminal Transport Company, St. Paul, says, "Stanolube HD speaks for itself in

the record of this truck." He's also enthusiastic about Standard's Streamlined Preventive Maintenance. You can get all the facts about this simplified P.M. Plan and Stanolube HD from your nearest Standard Oil Company (Indiana) office, or by writing 910 South Michigan Avenue, Chicago 80, Illinois. Ask for the Standard Oil Automotive Engineer.

Buy more War Bonds

**STANDARD OIL COMPANY (INDIANA)**

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CONSTRUCTION SERVICE

# New Hot-Mix Surface Improves Main Route

**Cooke Contracting Co. Job For Two-Course Resurfacing, 4.5 Miles Long, 40 Feet Wide, On Old Concrete Highway**

U. S. 24-25, known locally as Telegraph Road, a 40-foot concrete road in southeastern Michigan and the principal highway between Detroit and Toledo, was resurfaced in the autumn of 1944. The contract, awarded by the Michigan State Highway Department to the Cooke Contracting Co. of Detroit, called for 4.5 miles of two-course bituminous-concrete plant-mix. A 20-foot concrete pavement with a 9-inch uniform section had been laid on Telegraph Road in 1925 and in 1933 was widened with a 10-foot strip of 10-inch-thick reinforced concrete on each side. The old road had a  $4\frac{1}{2}$ -inch crown at the center which was generally maintained in the resurfacing.

#### Preliminary Patching

The first step in the improvement was the repair of the old concrete highway by removing cracked and broken sections and replacing with plain concrete of 9-inch uniform thickness. Patching began on August 16 with a Lorain Moto-Crane having a 35-foot boom handling a 3,900-pound steel ball to break up the sections to be removed. The ball was then replaced with a  $\frac{3}{8}$ -yard clamshell bucket for loading the concrete rubble into waiting trucks to be disposed of in waste areas obtained by the contractor. About 5,700 square yards of unsuitable concrete was thus removed, the patches ranging in size from 2 to 1,000 square yards. Truck-mixed concrete was used for patching, and the finishing was done by hand. The general mobility and speed of the Moto-Crane traveling on rubber tires resulted in the completion of the patching by September 8 when the resurfacing began.

#### Hot-Mix Surfacing

An asphalt emulsion, AE-2, with an asphalt base having a 61 penetration at 25 degrees C, was then applied as a bond coat at the rate of 0.15 gallon per square yard by a 1,500-gallon pressure

distributor with a 10-foot spray bar, mounted on a Ford truck. The asphalt came from the storage tanks at the contractor's portable hot-mix plant which was set up at the south end of the job. The bond coat was applied for about 1,000 feet ahead of the Adnum Black Top Paver which, using a 10-foot screed, laid the hot-mix in four 10-foot strips, beginning at the eastern edge of the road.

The mix was hauled to the paver in nine trucks, each of which carried five batches of  $1\frac{1}{4}$  tons for a total load of  $6\frac{1}{4}$  tons. Nearly 60 tons an hour were laid for a daily average of 525 tons. Eight men were used on the road job, not counting the truck drivers. Hand tools were kept clean of the hot-mix by dipping them in a pail of kerosene which



C. & E. M. Photo

The Cooke Contracting Co.'s assembled asphalt plant, with dust collector, produced  $1\frac{1}{4}$ -ton batches of hot-mix for resurfacing 40 feet wide on Telegraph Road near Detroit, Mich.

was carried along as the paver progressed. The steel bodies of the trucks were swabbed out five times a day with fuel oil. Other equipment on the paving included a 500-gallon water tank mounted on a Ford truck which supplied wa-

ter to the roller and paver to prevent picking up the hot-mix.

About a mile of binder course 10 feet wide was laid a day with an average thickness of 2 inches of loose material

(Concluded on next page)



## THEY PICK UP "EGGS" WITH WIRE ROPE

Giant "eggs" for our bombers require frequent handling before they are dropped on the enemy. Juggling heavy bombs is one of the vital everyday tasks which our men must perform . . . and one in which tough, dependable wire rope is important.

Less dramatic, but equally important, is the work which wire rope is doing on the home front. In oil fields, forests, mines, mills and shipyards . . . you'll find men relying on the stout, steel muscles of Wickwire Spencer Wire Rope to do a variety of heavy hoisting and hauling jobs.

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If you have a wire rope problem our wire rope engineers will be happy to help solve it. Just write Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, N. Y.



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We also manufacture Liquid  
and Vacuum Pumps, Strainers  
and Clutches.

# Hot-Mix Surface

(Continued from preceding page)

which compacted to  $1\frac{3}{4}$  inches under rolling by a Buffalo-Springfield 10-ton tandem roller. The laying of the top course went faster since the compacted thickness averaged from 1 to  $1\frac{1}{4}$  inches, and an average of  $1\frac{1}{2}$  miles a day of a 10-foot strip was maintained. Traffic was permitted over each course within an hour of the final rolling.

## The Mixes

The base and top courses were mixed in the following proportions:

Material	Per Cent	
	Top Course	Base Course
Stone	55.0	70.5
Sand	33.4	25.0
Limestone dust	4.0	0.0
Asphalt, 95 penetration at 25 degrees C	3.6	4.5
	100.0	100.0

The stone, sand, and limestone dust had the following gradations:

Passing	Per cent			
	Base Stone	Top Stone	Sand	Limestone Dust
1 $\frac{1}{4}$ -inch	100	.....	.....	.....
4 $\frac{1}{2}$ -inch	45-65	.....	.....	.....
3 $\frac{1}{2}$ -inch	.....	100	.....	.....
2 $\frac{1}{2}$ -inch	.....	90-100	.....	.....
2 $\frac{1}{2}$ -inch	0-25	.....	.....	.....
No. 4	0-10	0-25	100	.....
No. 10	.....	0-10	95-100	.....
No. 40	.....	.....	60-90	100
No. 80	.....	.....	20-40	.....
No. 200	.....	.....	0-5	75-100

Loss by washing, not over 3 per cent.

## Asphalt Plant

Materials for the mix were brought to the plant by railroad, the aggregate being stockpiled adjacent to the siding and the asphalt stored in twin tanks of 18,000-gallon capacity, 32 feet long x 10 feet in diameter. Another tank 10 feet high x 10 feet in diameter held 7,000 gallons of fuel oil. A Bucyrus-Erie crane with a 1-yard clamshell bucket kept the aggregate bins charged. From the bins the aggregate was raised by a bucket conveyor to a 25-foot x 4 $\frac{1}{2}$ -foot-diameter drier which was heated by two Best 3 $\frac{1}{2}$ -inch burners using fuel oil atomized by steam supplied by a vertical boiler which also furnished steam for the heating coils of the bituminous tanks and to drive the asphalt pump. Motive power for the drier and pugmill was furnished by a Climax Model TU gas engine.

From the drier the aggregate was carried by the hot elevator to two Deister vibrating screens, 83 $\frac{1}{4}$  x 36 inches, where the sand and the stone were separated and delivered to storage bins. The aggregates were weighed by a Kron scale before delivery to the pugmill for the 1 $\frac{1}{4}$ -ton batches. The dust from the bins and pugmill was drawn off into an Allington & Curtis dust collector.

For the base course the batch was mixed for at least 45 seconds in the pugmill, while for the top course a minimum of 60 seconds was required. When delivered to the trucks, the temperature of the mix was between 300 and 350 degrees F.

## Shoulders

The road was completed with 8-foot shoulders constructed of crushed stone and screenings hauled from a limestone quarry at Trenton, Mich., 5 miles be-

yond the north end of the project. All of the material had to pass a 1-inch sieve, while 10 to 20 per cent passed a No. 200 sieve to supply the screenings. For 1,000 linear feet on each side of the road, 104 tons of material was necessary; it was spread 4 to 5 inches deep and then shaped up by a Caterpillar power grader. The job was completed on November 1.

## Quantities and Personnel

Major bid quantities under this contract included the following:

Removing old pavement	5,700 sq. yds.
Concrete pavement, 9-inch uniform	5,700 sq. yds.
Bituminous bond coat, AE-2	16,000 gal.
Bituminous base, binder course	10,669 tons
Bituminous top, surface course	6,554 tons
Crushed-stone shoulders	5,086 tons

While this contract was under way, similar resurfacing was being done by another contractor on a 3.4-mile section immediately to the north and a 4.2-mile section adjoining on the south.

The contract for this 4.5-mile bituminous resurfacing project on U. S. 24-25 in Michigan was awarded to the

Cooke Contracting Co. of Detroit for \$174,935.75. An interesting feature of this job is the closeness of estimated quantities to used quantities. The base course and top course totaled 17,223 tons estimated and 17,230.185 tons used. Charles M. Ziegler is Michigan State Highway Commissioner.

## Protective Coatings

### For Metals and Wood

A new 20-page booklet describing and illustrating typical applications of protective coatings for metal, brick, cement, and wood surfaces, and also describing Creocote paint for creosoted wood-block floors, poles, guard rails, and posts, has recently been issued by Reilly Tar & Chemical Corp., Merchants Bank Bldg., Indianapolis 4, Ind. This bulletin, No. 2-PC-45, covers: pipe enamel and primer for oil, gas, gasoline, and water lines, or for any steel-pipe lining; cold application CA No. 40 for tanks, structural steel and other metal surfaces exposed to the atmosphere and to corrosive gases; cold

application CA No. 5 for tanks and metals which serve underground or under water and also for waterproofing concrete; cold application CA No. 50 for metal exposed to erosion, abrasion, and to the action of either fresh or salt water; Resiscote for metal and concrete surfaces; Creocote paint, available in colors, for creosoted wood-block floors, poles, guard rails and posts, and other creosoted surfaces; and bituminous pipe dip compound for hot dipping cast-iron pipe and fittings.

Copies of this bulletin may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY by writing direct to Reilly and mentioning this review.

## New Gar Wood Dealers

The General Machinery Co., E. 3500 Block, Riverside Ave., Spokane, Wash., and Equipos Hobbs S. A., Mexico City, have been appointed by the Gar Wood Industries, Inc., Detroit, Mich., to distribute the products of its Hoist and Body and Tank Divisions.



3 $\frac{1}{2}$  to 30  
CUBIC YARDS

★ 20% to 40% lighter than other buckets, type for type.

★ All welded construction for greater strength and durability.

★ Manganese Steel chains, fittings, and reversible tooth points.

★ Full Pay Load every trip, even in wet digging.

★ Perfect Balance: handles easier, fills faster, dumps quicker.

★ Three Types: light, medium, and heavy duty. With perforations or solid.

**HENDRIX**  
*Lightweight*  
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**BUCKETS**

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It's easier to lift, lower, push or pull the Simplex Way!  
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LEVER SCREW HYDRAULIC  
for every construction purpose  
Awarded the Gold Medal for Safety  
Ask for Catalog 44  
Templeton, Kenly & Co., Chicago 44, Ill.



Starting as an experiment at a cost of about \$10, the Glenn Martin Co.'s bearing service station now saves over \$150,000 annually, and keeps in operation many machines which otherwise would be down awaiting new bearings.

### A Service Station For Your Bearings

A very interesting example of what has been done in one of our war plants at small investment to salvage and to keep bearings functioning has come to our attention from the Conservation Department of The Glenn L. Martin Co., Baltimore, Md. Many highway departments can put a similar arrangement into action and save much money. Originally started with an investment of less than \$10, the Glenn Martin "bearing service station" has been operated on a partially experimental basis for the past year.

The new station, which has functioned in a floor space 6 x 8 feet, already has resulted in a saving in excess of \$150,000. The original investment represents the cost of small hand tools, including several screw drivers, a ball-peen hammer, three pairs of pliers, and a simple jig. During the year a small hand press and an electric drill were added.

The project started when bearing shortages began to affect parts production in the Martin plants. An employee, Earl Caudill, began experimenting with a few bearing assemblies which had been rejected by the Quality Control Division and, after repair work was completed, took them to both the Army and Navy inspectors to get their opinions as to whether the repaired parts would meet specifications. Finding that they did, he experimented with other types of assemblies and soon had developed a mental "repair manual" on practically every type.

Most common types of repair now performed by the servicemen are removing foreign matter, repairing bent shields, and remedying tight bearings. The former results in many discarded bearing assemblies being put back into use, and the latter is particularly valuable for repairing parts of the production machines in the plant.

Sometimes the men take parts from several different assemblies and combine them to make a new one. A good example of this occurred recently when a huge drill press in the plant broke down. Outside manufacturers could not furnish the new bearing for some time, so the servicemen took parts from two used bearings and combined them to make a much needed one which worked satisfactorily until the new part could be installed.

### Recap Supervisor Named

Ray S. Jenkins has been appointed General Supervisor of all field recap plants of The B. F. Goodrich Co., Akron, Ohio, according to E. E. Arrington, Manager of recap plant operations. Mr. Jenkins, formerly a member of the Boston district staff, will coordinate the activities of recap plant supervisors in the field and act as assistant to Mr. Arrington.

### Membrane Compound For Concrete Curing

A transparent membrane concrete-curing compound, with or without fugitive coloring, which is applied at the rate of 200 to 400 square feet per gallon is being made by The Aquabar Co., Perry Bldg., Philadelphia 2, Pa. This compound, Kuraseal "A", forms an impervious transparent film on the concrete surface which prevents evaporation of the moisture required for complete hydration of the cement. The compound is applied to the exposed surfaces of concrete floors, beams, and roadways as soon as the concrete has hardened sufficiently so that it will not mar under the treatment, or as soon as the forms are removed, in the case of form surfaces.

Kuraseal "A" dries in approximately 30 minutes, forming a continuous water-repellent film. It has been tested by the U. S. Engineer Laboratories at Mount Vernon, N. Y., Mariemont, Ohio, and Los Angeles, Calif.; by the Public Roads

Administration at Arlington, Va.; and many state highway departments.

Complete information regarding the tests of Kuraseal, mechanical and hand

spray equipment for applying it, and the cost of the compound itself may be secured direct from the manufacturer. Please mention this news item.

# WINPOWER

**ELECTRIC PLANTS**

**MODELS 12DL & 15 DL**

**1250 WATT and 1500 WATT**  
**110-VOLT DIRECT CURRENT—MANUAL**  
**STARTING**

*Immediate delivery on many units 350-5000 watts on priorities of AA-5 or better.*

These models have extremely high output for their size and weight. They are recommended for portable work on road and construction jobs, repair depts., fire depts.; indispensable for lighting and operating of electric tools such as portable compressors, drills, saws, sanders, etc.

Four Cycle - Easy Starting - Heavy Duty Engines  
Will Run All Day On 2½ Gals. of Fuel

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**WINPOWER MFG. CO.,** **NEWTON, IOWA**

## CONTRIBUTING TO HEAVY ACTION in HEAVY INDUSTRY



Behind the roar of the big guns, industry has performed, ever since Pearl Harbor, unbelievable production feats. On the record-breaking construction jobs, in the constant shifting of great masses of materials, Osgood Mobilcranes and General Supercranes are giving a mighty hand to the Victory effort.



Meanwhile, peacetime construction waits its turn. When it comes, history's greatest backlog of activity will produce new records to shoot at . . .



. . . and the booms of Mobilcranes and Supercranes will be in there "swinging"! You can rely on these big rugged and war-proven outfits, to do more work faster. They are unit-designed, one-man controlled, one-engine operated and they roll on rubber. Thus you get the basic advantages of greater mobility, efficiency, power and speed . . . keys to reduced cost and increased profits.

*The Machine of Tomorrow*  
Crane, shovel, clamshell, plowdrill, backhoe—all wrapped up in one compact, revolutionarily-designed machine. Powered by a single engine, controlled by a single operator, mounted on rubber tire. Cleans up all types of materials handling, construction and excavating jobs with profit leadership. Write for details!

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**GENERAL TYPE 10**  
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**THE OSGOOD CO.  
MOBILCRANES**



**THE GENERAL EXCAVATOR CO.  
SUPERCRANES**

MARION, OHIO

## Veterans' Hospitals Need Access Roads

Turning from providing access roads to the factories making the engines of war, we now face the need for improved transportation facilities to many of our veterans' hospitals which are being enlarged with great speed to accommodate the thousands of casualties returning to their home shores.

An example of the need for such construction is the approach to the Harvey Cushing Hospital in Framingham, Mass. The major approach highway, Mt. Wayte Avenue, is particularly dangerous because of the hazardous curves and a narrow limited-capacity wooden bridge over the local railroad tracks, with steep and blind approaches. Citizens of Framingham are urging early approval of the improvements to this road which are already in the hands of the Public Roads Administration and War Production Board.

At the present time, there is no adequate access road leading to this insti-

tution from the north and the east over which buses, trucks, and other vehicular traffic may pass to and from the hospital. Originally, when the hospital opened some 18 months ago, there were only four bus trips a day scheduled. Today there are some forty scheduled trips, and this number is continually increasing in line with the increasing population of the hospital. Over 1,000 taxicabs per day make round trips between the hospital and downtown Framingham. Hundreds of visitors, patients, and hospital staff workers travel back and forth between the town and the institution daily. The hospital is continuing to expand and will undoubtedly be a permanent institution, and the volume of vehicular traffic will increase still further in the future.

This great institution at Framingham is only one example of the many similar necessary institutions which will have increasing numbers of visitors approach their doors for many months, even years, after World War II has become history.

Keep on buying War Bonds regularly!

## Highway Users Name

### Butler New Director

The National Highway Users Conference has announced the appointment of Arthur C. Butler as Director and P. D. McLean, for several years head of the Information Department, as Assistant Director.

Mr. Butler, who assumed his new duties early in June, has had wide experience in the motor transport field for the past fifteen years. In 1930, he joined the staff of the National Automobile Chamber of Commerce, New York, and in 1932 was appointed Manager of the Motor Truck Division of the Automobile Manufacturers' Association.

## SAFE-LINE

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1/3 PINT PER  
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For Filling all Types  
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• The new Graco Grease Pack is designed for use in the field or shop. It is easily carried. The pump is simply constructed, easy acting, and works well with most any gear lubricant.

### FEATURES

Capacity, 28 pounds • Electrically welded 4-ribbed container • Dispenses approximately  $\frac{1}{3}$  pint per stroke • 5 1/2-foot hose assembly • Non-drip nozzle • Hopper bottom—dispenses all the grease • Weight, 22 pounds • Height, 21 1/2 inches • Width, 16 inches

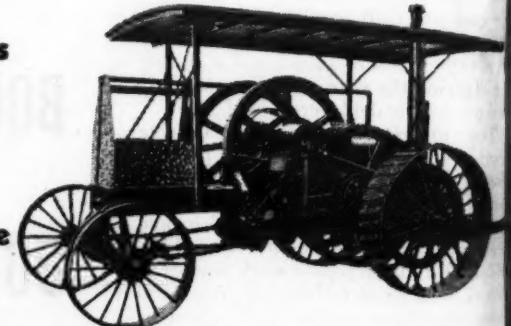
Write for details and catalog 191.

**GRAY COMPANY · INC.**

MINNEAPOLIS 13, MINNESOTA



Are the Joints  
in Your  
Tractor's  
Steering  
Column  
Out-of-Date  
?



Way back when the tractor's top speed was three or four miles an hour, chains could handle the steering. But since rubber tires and anti-friction bearings have made higher speeds possible, steering column designs require joints having roller bearings and lifetime lubrication. MECHANICS 1 RA Roller Bearing

Steering Joints, using heat-treated alloy steel hardened and ground to precision and factory packed with lubricant for life, provide easy, accurate and long lived steering . without further lubrication. Modern design utilizing stampings and brazing, results in a price you can afford.

## MECHANICS Roller Bearing UNIVERSAL JOINTS

### Mechanics Universal Joint Division

BORG-WARNER CORPORATION 2026 Harrison Avenue Rockford, Illinois

MECHANICS Roller Bearing UNIVERSAL JOINTS ARE SERVING IN





The Porto Batcher, with a total bin capacity of 45 tons, is designed as a complete portable batching plant, easily transported and erected at the job site.

### Johnson Porto Unit For Site Batching

Originally designed as a complete portable highway batching plant, the Porto Batcher made by C. S. Johnson Co., Champaign, Ill., is being used with large concrete plants on bridge and other jobs where the distance from the main plant is a handicap and transportation a problem. Ready-mix operators, who lack a suitable site for a larger plant, have found this unit useful, particularly in smaller communities.

The Porto Batcher may be quickly and easily towed from job to job by an ordinary truck and set up on any level area near the pouring site. It is unnecessary to dig pits or construct a foundation, and no crane is required for handling the aggregates or for setting up the plant.

The plant has a total bin capacity of 45 tons in three compartments arranged for two truckloads in each compartment. A 5-cubic-yard truck receiving hopper and a 90-ton-per-hour aggregate elevator are part of the plant. The Porto Batcher is made to operate with truck mixers, stationary mixers, or paver batch-trucks. One-man control of the entire batching operation is provided by centralized grouping of the controls.

Complete information on the adaptability of the Johnson Porto Batcher to various concrete problems may be secured from the manufacturer by writing direct and mentioning this illustrated news item.

### Minn. Road Magnet Assembled at Shop

The road magnet which has been operated by the Minnesota Department of Highways with such success in the removal of miscellaneous metal scrap from the state highway system was assembled in the Department of Highways shops by Hamilton Lufkin, Mechanical Engineer of the Department. In the first 75 miles of highway covered by this unit, upwards of 15 pounds of scrap per mile was collected in addition to an assortment of wrenches, pliers, and other small tools.

Electric power for the magnet is provided by an Onan W3D 3,000-watt direct-current portable electric plant driven by an Onan-built 2-cylinder water-cooled gasoline engine of 7 hp. The magnet is a single unit with a pole face 18 x 96 inches and weighs 2,300 pounds. It requires 2,400 watts at 110 volts, direct current, for operating. The magnet was installed by the Minnesota Department of Highways but was made by Stearns Magnetic Mfg. Co., Milwaukee 4, Wis. The light weight, high efficiency, and simplified mounting of this magnet and electric plant permit operation speeds up to 12 miles per hour.

### Tolls Will Finance Proposed Pa. Parkway

With three well known investment houses ready to furnish between \$7,000,000 and \$10,000,000 to finance the construction of the proposed Rim Parkway through the top of the Pocono Mountains in eastern Pennsylvania, the expectation that this toll-operated scenic highway will be an early post-war project is increasing. John U. Shroyer, Secretary of Highways of Pennsylvania, reports that the sum of \$100,000 has been appropriated by the State for the survey which will start before summer.

This 60-mile scenic parkway will begin at the famous Delaware Water Gap near Stroudsburg and will extend northeast, curving around Blue Ridge Mountain and the Poconos, ending at Bushkill. The highway will be built without using tax funds, through bond issues sold by the three investment houses. A moderate toll will be charged to finance the bonds and as soon as they have been paid off the route will become the sole

property of the Pennsylvania Department of Highways. It has been recommended that the Parkway become a memorial to the soldiers of all wars.

Proponents of the Parkway state that if prompt action is taken it will be possible for Pennsylvania to have, within two years after the war, one of the greatest state parkways and park developments in America. The 60-mile highway will have a minimum width of right-of-way of 300 feet and will connect and make accessible thousands of acres of state forest lands and parks in Monroe and Pike Counties, including Child's Park, Promised Land Pond Park, Big Pocono Game Refuge, Peck's Pond, and other state-owned lands.

Studies made by representatives of the investment firms indicate that the toll revenues will be sufficient to make the Parkway entirely self-supporting and self-liquidating. Their traffic survey shows that in normal years before the war 15,000,000 cars annually passed the entrances to the proposed new scenic Parkway.



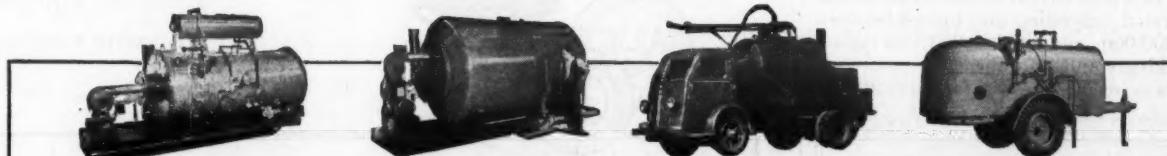
• to see why you get  
hot, dry steam faster  
with less fuel and water

● The cross-section illustration graphically shows the famous Cleaver-Brooks four-pass down-draft construction which, with integral oil-burner, accounts for the remarkable efficiency of Cleaver-Brooks steam generating equipment.

This construction doubles the lineal gas travel, compared to ordinary two-pass boilers,—the result is unmatched high heat transfer and efficiency.

No other equipment has this original and exclusive four-pass down-draft construction—plus the perfected positive dry coil method of condensate return—that's why you get hot, dry steam faster with less fuel and water with Cleaver-Brooks equipment. Write for bulletins and complete information.

**CLEAVER-BROOKS COMPANY**  
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Automatic Steam Plants

Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.

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Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure—no water or heat loss. Provides a portable source of steam wherever needed.

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# Post-War Construction Plans in West Indies

**Three Island Republics Anticipate Increase in Local Construction; Some Public Works on List; the Trend Is Towards Self Sufficiency**

LIKE the rest of Latin America, the three West Indian republics of Cuba, Dominican Republic, and Haiti anticipate an increase in local construction activity as soon as adequate supplies of construction materials become available after the war's end, according to an article prepared by the Construction Unit, Bureau of Foreign and Domestic Commerce, for *Foreign Commerce Weekly*.

Private building is expected to set the post-war pace in Cuba, although the program of public works now under way will probably carry over well into the peacetime years.

In the Dominican Republic, public works will predominate, as the Government plans the improvement of two major ports, the extension of irrigation facilities, and the erection of a number of public buildings. Private building will also be active and will include the development of an extensive agricultural area and the construction of a port through which its products may be exported.

As to Haiti, there is no indication at present that any great change is in prospect either in volume or character of the construction to be undertaken after the war.

## Cuba

Two factors will determine very largely the volume and character of post-war construction activity in Cuba: (1) the number of facilities built since 1937 when the current period of rising construction activity began; and (2) post-war prices and markets for Cuban sugar and tobacco.

Public construction became a major factor several years ago, and the appropriations made by the Cuban government for the construction of public works reached the large sum of \$4,500,000 during the month of July, 1944, whereas the monthly average between October, 1943, and July, 1944, had been approximately \$1,850,000. Among the projects being undertaken are the repair, widening, and construction of streets in various cities, as well as schools, hospitals, barracks, and similar public buildings.

As examples of proposed industrial expansion in Cuba, an important U. S. firm which manufactures rubber-soled tennis shoes contemplates the establishment of a plant on the island, and other firms are reported planning the operation of tire-repair and rubber-goods production facilities. In the steam-power generating field, post-war potentialities are concerned chiefly with the plants of the Compañía Cubana de Electricidad, principal power company, which is reported to be contemplating the construction of a new 25,000 to 50,000-kw steam-operated generating unit to cost between \$5,000,000 and \$7,000,000, including machinery and equipment.

As a result of surveys in 1938 and

1939 by the Ministry of Agriculture to determine the feasibility of diverting river water for irrigation by means of low diversion dams, thirteen irrigation projects have been proposed. Tentative plans have been drawn for four of these projects to cost \$350,000, \$350,000, \$300,000, and \$1,000,000 respectively. The first of these projects has been completely approved and has been advertised for bids. Plans for the second have been finished but not yet finally approved, while no definite plans have been completed for the remaining two.

Up to the present time, allocations have been made for only \$11,000,000 of the \$25,000,000 credit established by the Export-Import Bank of Washington in favor of the Cuban government for use in certain public-works projects. Of this \$11,000,000, \$6,000,000 has been allocated for repairs of the Central Highway, \$2,500,000 for auxiliary roads, and \$1,000,000 for sanitation in Santiago de Cuba.

No reliable information is available as to the extent and character of the

post-war public-works program, but undoubtedly those projects already undertaken will be completed, and certain additional ones will be initiated. For example, the rehabilitation of the Havana water works, a \$15,000,000 project, and the construction of sewerage and water systems in other important cities of the island have been under study and discussion by the Government, municipalities, and other interested entities, but final arrangements have not yet been made.

As to wharf and other port construction, it is reported that the Consolidated Railroad has received authorization for building a concrete wharf at Pastelillo (Nuevitas Bay) to receive ships having a draft up to 32 feet.

Until recently, road-building machinery in Cuba consisted chiefly of equipment taken over by the Government from the contractor who constructed the Central Highway, which was completed in 1931. However, during the past year, contractors engaged in building the several air bases constructed on the island

by the U. S. government have sold to private contractors and to the Cuban government much of the equipment they brought in for this work. This machinery, which includes trucks, tractors, concrete mixers, road rollers, and compressors, is being employed in the public works now under construction. It is anticipated that very little additional equipment will be required for post-war construction, although there may be some demand for a few items which have not been attainable during the war.

As far as engineering services are concerned, there are at the present time no post-war projects contemplated which would require the technical services of U. S. engineers or contractors. Only for highly specialized undertaking involving special processes would technical advice be necessary. Some U. S. firms with offices in Cuba have contracts for construction projects in various parts of the island, such as the sewerage and drainage work at Cienfuegos, estimated to cost \$1,800,000.

(Concluded on next page)



Don't gamble when buying a mixer or paver. Be assured of quality performance and guaranteed capacity by choosing one carrying the AGC rating plate.

The AGC rating plate is your guarantee that your mixer or paver will deliver its full rated capacity. That's a mighty important factor when estimating those "close" jobs.

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# Post-War Construction Plans in West Indies

(Continued from preceding page)

## Dominican Republic

Construction activity in the Dominican Republic in the post-war years will continue to be dominated by the Government's extensive program of public works. In fact, although a substantial increase in the volume of private construction is anticipated as soon as adequate supplies of imported materials once more become available, it is evident that expenditures for public works will continue to be several times as great as those for private work.

Since public construction in the Republic may be undertaken without the formality of obtaining a permit, there are no comprehensive records available to indicate total activity. It is known, however, that in both 1942 and 1943 approximately \$5,000,000 was spent for public works, including projects which were part of the "Dominicanization" program in the provinces bordering Haiti, in the expansion of irrigation, and for several buildings in Ciudad Trujillo commemorating the first centennial of Dominican independence.

The Dominican government has under way or in some stage of planning an extensive program of public-works construction. Well advanced is a textile plant and a cement plant. The latter, located near Ciudad Trujillo, is scheduled to have a capacity, upon completion, of 360,000 barrels of cement a year, a potential production well in excess of imports in any recent year. Port improvements also rank high in the list of public-works projects. Existing facilities at Ciudad Trujillo are to be extended by the construction of additional breakwater and the erection of warehouses, as well as through dredging the harbor. It is also proposed that the Republic's principal sugar port, San Pedro de Macoris, be improved by dredging the present channel, the construction of a dock and warehouses, and by the addition of other facilities now lacking. Irrigation works in the rich but semi-arid agricultural districts of the Republic will be extended, whereby water will be brought to additional areas. Studies are also being made of the Rio Yaque in the vicinity of Santiago as a possible site for

a hydro-electric development to be undertaken under Government auspices.

All public-works projects undertaken will be developed and their construction supervised by the Bureau of Public Works which may, at its discretion, let contracts to private firms for the performance of the actual work involved. It is stated that, except for work specifically designed by and undertaken for the account of U. S. firms, local engineers and contractors probably will design and construct all work being planned in the Republic.

Owing to the low cost of labor in the Dominican Republic, only a minimum use is currently made of machinery in construction. Concrete mixers are probably the equipment most widely used and for which there will be the greatest post-war demand. Earth-moving and other construction equipment now being used in developing irrigation facilities will, it is anticipated, be adequate to complete all of the work in progress or contemplated, with new equipment to be purchased only as wear makes replacement necessary.

## Haiti

It is reported that construction in Haiti probably will continue at about its present modest level for some time after the war. There are no statistics on total construction activity in Haiti. Public works and construction in rural districts do not require permits, and construction undertaken by large private companies appears also to have been exempted from the necessity of obtaining prior authorization, since the rather small volume recorded obviously does not include the operations of the Société Haïtiano Americaine de Développement Agricole (SHADA) or of the Pan American Airways.

It is evident that expenditures for new construction probably seldom exceed a few hundred thousand dollars a year, except where some large project is undertaken by a foreign company operating in Haiti or by the Haitian government itself. While possibly \$1,000,000 may be spent for new construction in Haiti in the early post-war years, no plans for any specific project have progressed to the point where their accomplishment is assured.

The bulk of the construction equipment now available in Haiti is described as a heritage of the operation of the J. G. White Engineering Corp. Additional units belong to SHADA, the Public

Works Department, and to private construction companies. It is reported that for want of replacement parts much of it is in poor condition. Even so, it is considered that it should prove generally adequate to the limited volume of post-war construction in prospect.

Lack of any extensive post-war construction program precludes the possi-

bility of U. S. engineers or contractors being employed for such work as may be undertaken.

*All our resources and man-power are needed for victory, so your present equipment must be made to last for the duration. Regular and correct lubrication will help.*

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- ★ Cargo Conveyors for Industrial Use
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- ★ "Motomove" Self-Propelled Conveyors

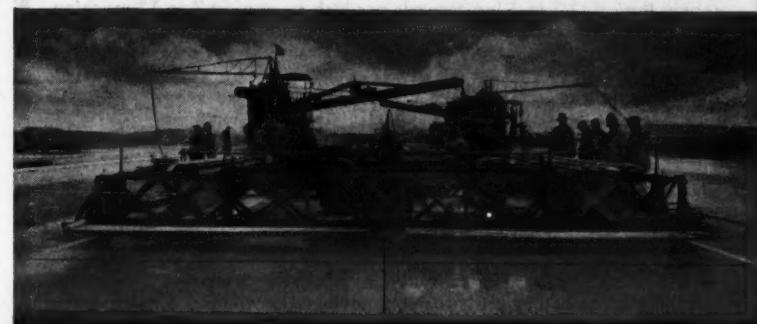
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When  $\frac{1}{8}$ " thick material is used for dummy joints, the joint material should not be *too soft* or *too hard* but just right to allow compression when the *upper part* of the slab is under intense heat.

'FLEX-PLANE' installed joints *insure* good value in concrete roads.

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Most powerful, most versatile electric hammers made.

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Available with tools for drilling, cutting or spading. Will do light duty work or any heavy duty work. The Master Hammer runs without striking a blow until pressure is applied, enabling operator to control blow as job requires. Easy and economical to operate. Built for light weight and long service. Used throughout the world. Power blow hammers operate on 115 volt AC or DC, 25, 50 or 60 cycle. If no electricity is available use Master Portable Generator Plant Model 650 (illustrated above).

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Products include: Portable Gasoline Generator Plants, 500 watts to 17,000 watts.  
Voltage Regulators and Portable Mountings Optional. • Master Floor and Shovel Lights  
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and Spade, Hammer Tools • Vibrating Compacting Machine and Tools • Vibrating Hammer and Tools

## Highways Are Major Construction Activity

Highway work in the future, as in the past, will constitute an important part of the total construction activity which will be at once necessary and desirable in meeting the needs of demobilization, industrial reconversion, and the reestablishment of peaceful pursuits. The magnitude of highway construction in the future scheme was ably demonstrated by Hal H. Hale, Executive Secretary of the American Association of State Highway Officials, in a paper presented before the Highway Division of the American Society of Civil Engineers at its annual meeting.

In the 21-year period from 1920 to 1940, inclusive, highway construction provided almost precisely half of the total dollar volume of all public construction undertaken inclusive of work relief expenditures during the depression. In the same period, public construction formed about one-third of the total volume of all construction activity.

### Proportions of Highway Work in Public Works (Including Work Relief) and Total Construction Volume

Period	Total Construction	(Annual Averages in Millions of Dollars)			Public as % of Total	Highways as % of Public
		Total	Public Construction Highway	Other		
1920-22	\$ 6,207	\$1,514	\$ 777	\$ 737	24.4	51.3
1923-25	9,429	1,856	930	926	19.7	50.1
1926-28	10,038	2,314	1,166	1,148	21.4	50.4
1929-31	8,256	2,588	1,351	1,237	31.3	52.2
1932-34	2,968	1,729	923	806	58.3	53.4
1935-37	4,427	2,658	1,225	1,433	60.0	46.1
1938-40	5,913	3,465	1,539	1,906	58.6	45.0
1920-40	\$ 6,063	\$2,303	\$1,133	\$1,170	33.6	49.2

In no 3-year period did the average of highway construction, as a percentage of the average of all public construction, fall below 45 per cent, or exceed 54 per cent, as shown in the table.

In the stability of the proportions of highway construction shown, there is decided significance. These data reflect the relative need for highway work and for other forms of public works, and provide ample reason for the belief that these relationships will continue in the future, with highway construction as one-half of public construction, and public construction as one-third of total construction.

a vertical path. This carries material forcibly downward at the same time it is being crushed. The material drops at the end of the first stage onto a sloping shelf carrying a removable bleeding screen with holes of any desired size. This screen has the same circular motion as the eccentric and the same revolution per minute. All material from the upper crushing chamber passes onto and through this screen with only the oversize going to the secondary crushing chamber for further reduction. Ebersol jaw crushers are made in 10 x 20, 15 x 24, 8 x 40, and 12 x 40 jaw opening with manganese-steel cheek plates.

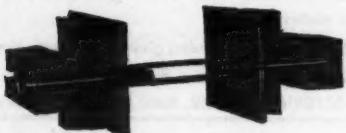
The manufacturer has licensed the Barber-Greene Co., Aurora, Ill., to make the Ebersol crusher for portable use while Ebersol retains exclusive rights in the stationary field. Complete information regarding this two-stage crusher will be found in an 8-page bulletin "Topping Them All" which may be secured by our readers writing direct to Ebersol and mentioning this item.

## RICHMOND TYSSTRU FORM TIE SYSTEM

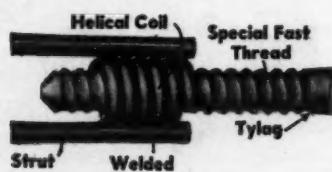
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Simplicity, Planning, Savings

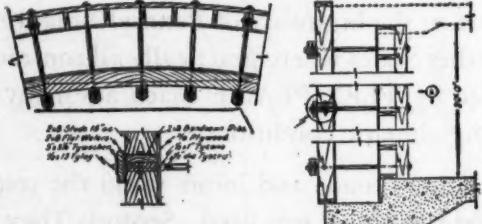
### PLANNED FORM WORK BY RICHMOND ALSO SPEEDS CONCRETE CONSTRUCTION



Richmond's Form Tying Devices are based on a simple principle consisting of the use of a Helix coil resistance welded to high strength wire struts to act as a threaded socket for Richmond coarse thread Tylag bolts. In action the high strength wire and Helix coil develop the full strength of the Tylag Bolt which by reason of its simple construction and coarse thread (3½ to 6 lag threads per inch as against 7 to 12 machine threads per inch) can be reused indefinitely with no depreciation.



**Simplicity:** Coarse thread principle provides for ease of installation, durability of accessory parts for continuous reuse without damage and permits for convenient use of the TysSTRU for the many reanchorage requirements incidental to form and scaffold requirements.



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**Savings:** Savings are further assured because Richmond reusable Accessory devices, known as "Working Parts," are furnished RETURNABLE FOR FULL CREDIT — no rentals charged.

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The main jaw is moved by an eccentric shaft and has a rotary motion while the opposing jaw moves up and down in

## General Utility Loading Device-



## The TRUK-LODER

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Fills truck in 2-3 minutes  
—in full view of driver

For all makes and models of trucks

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The Truk-Loder will do most of the operations of a large and costly shovel—loading dirt, gravel, crushed stone, street patch material, snow, leaves or refuse. The operations are economical and the Truk-Loder is priced

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For those who require a shovel for a few days, or for a few truck loads at a time, the Truk-Loder is a most practical unit, since by removing two hinge pins, it can be detached in only a few minutes.

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Official U. S. Navy Photo  
By means of a Kyster winch on the rear of this Caterpillar D6, members of a Seabee Battalion pull the tractor up an embankment to the top of a lava pit on New Britain Island in the Solomons.

## Bituminous Treatment Of Soil Under Concrete

The phenomenon of the warping of concrete pavements, particularly adjacent to joints and cracks, has long been recognized and has been the subject of many papers and discussions. The destructive effect of such warping is also well known. Among the probable causes of distortion of slabs are external forces, such as non-uniform soil swell and frost action caused by water entering the subgrade through cracks and joints, and non-uniform shrinkage of soil caused by moisture loss. The internal forces which cause warping are vertical moisture and temperature differentials and the unequal deposition of crystalline matter in the top and bottom of the slab.

In 1934, C. L. McKesson, Director of Engineering and Research, American Bitumuls Co., started tests which are reported in a paper prepared for the Twenty-Fourth Annual Proceedings of the Highway Research Board. He believed that high moisture content in the bottom of the slab due to contact with the saturated subgrade and the lower moisture content in the surface of the slab where it was exposed to evaporation were substantial factors in producing warping. His tests were made to determine the difference in warping of slabs on a granular sub-base containing a low clay content and an identical sub-base rendered water-resistant by the admixture of 3 per cent of emulsified asphalt.

When water was made available to these sub-bases, the untreated base became saturated quickly and warping resulted. On the treated sub-base the absorption of moisture was insufficient to cause measurable warping. The concrete beams were allowed to remain in place for ten years and in 1944 it was found that the 5-foot-long slab on the untreated subgrade had a permanent warp upward at the ends of between 0.20 and 0.25 inch. The slab on the treated sub-base showed no measurable warp.

In 1938, the Cities of Oakland and Los Angeles, Calif., constructed projects of substantial size on which the sub-grade was made water-resistant by the incorporation of a small quantity of emulsified asphalt, usually 3 per cent, mixed to a depth of 4 inches. All of these projects at the present time, after about six years of service, are remarkable in their freedom from cracks and lack of warping at joints. In no case is there evidence of vertical movement at joints. These projects are more fully described in the paper.

Mr. McKesson feels that the reason for the successful performance on these projects may be: (a) uniformity of moisture content in the top and bottom of the slab on a treated base due to the reduced rate at which moisture passes upward from the subgrade to the slab; (b) prevention of surface leakage saturating the subgrade beneath and adjacent to joints and cracks, with a result-

ticularly under and adjacent to cracks in the slab, due to the retarded rate at which subgrade moisture can escape upward through cracks and joints when the subgrade is protected by an intervening moisture-resistant sub-base; (d) relatively uniform support of the slab at and adjacent to cracks in both wet and dry weather; (e) added load-supporting strength of the entire slab due to the increased bearing value of the treated sub-base.

these types of tools.

Copies of this 44-page well illustrated catalog on SkilTools may be secured by those interested direct from Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill., by mentioning this item.

## Mack Appoints Walker Chief Sales Engineer

John Walker has been made Manager of the Sales Engineering Department of Mack-International Motor Truck Corp., with headquarters in the Mack executive offices, Empire State Building, New York City. Mr. Walker, who has had wide experience in the application of special engineering principles to unusual transportation problems, has been with the company since 1918. After serving two years in the Engineering Department, he was transferred to Special Equipment and in 1922 was placed in charge of the department. In 1942 he became Assistant to the Chief Engineer, a position he held until his present appointment.

## Do's and Don'ts in Care Of Portable Electric Tools

A feature of the new catalog on portable electric SkilTools is the section on the care and operation of this type of equipment, a study of which will help to keep your electric tools in service longer and more productively. In addition, the catalog presents the line of SkilDrills in various sizes and models, SkilSaws for a multitude of cutting jobs, SkilSanders for grinding, sanding, and filing work, SkilGrinders, and accessories for all

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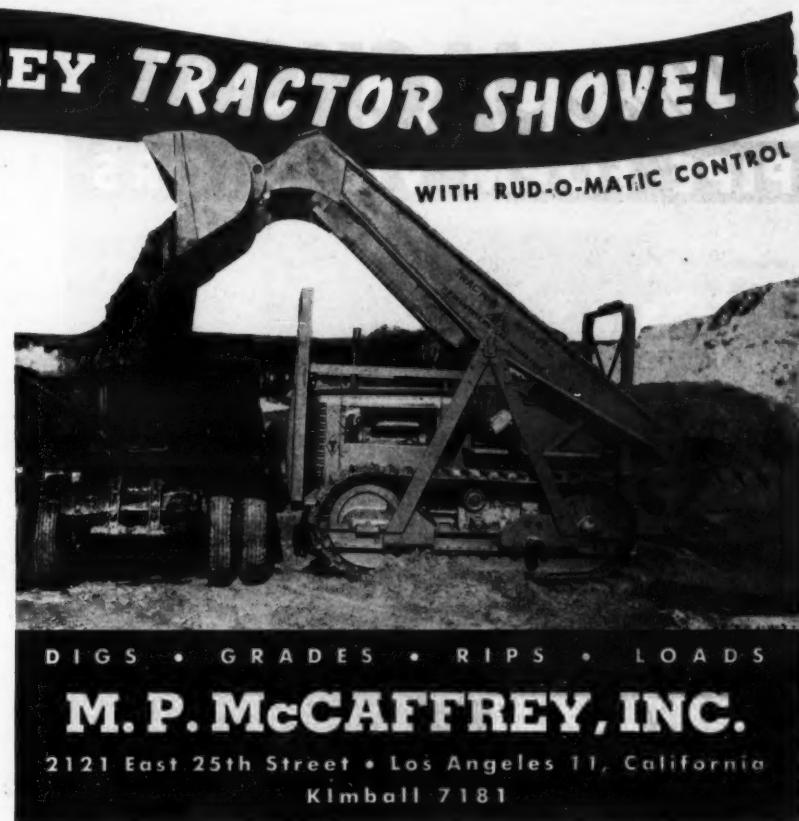
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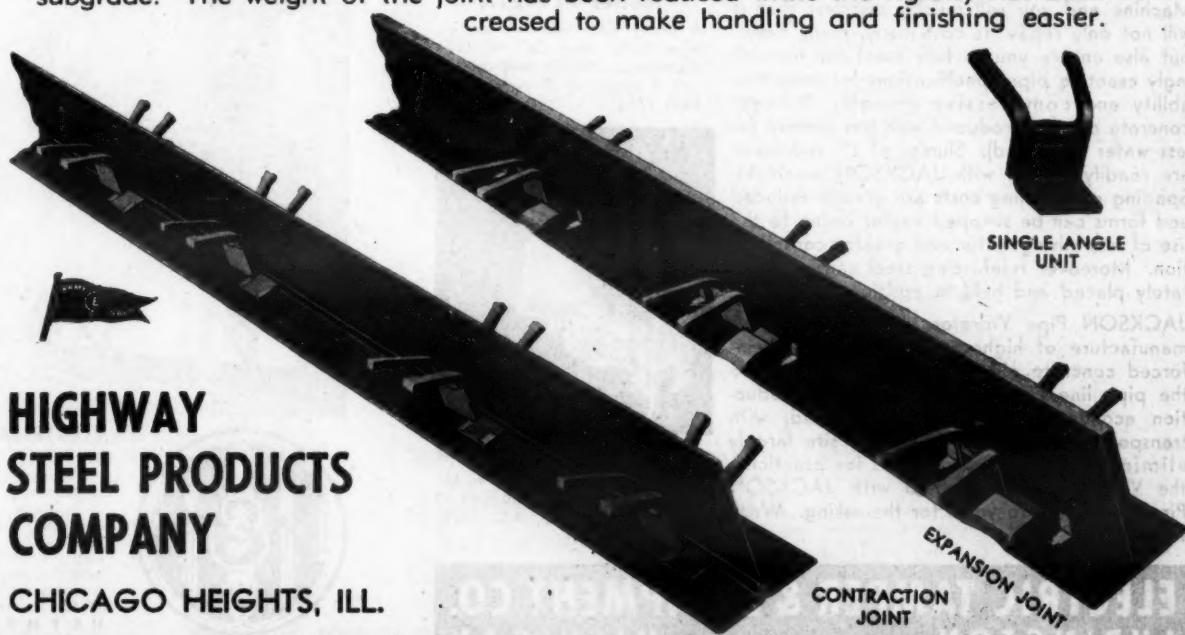
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Expansion and Contraction Joints have been giving excellent load transfer performance on thousands of miles of American pavements since 1932. Today's improved and simplified design retains the continuous base which makes installation easier and seals the joint against the infiltration of dirt from the soft subgrade. The weight of the joint has been reduced while the rigidity has been increased to make handling and finishing easier.



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## Road Construction In China Since 1921

The modern road-building movement in China was started in 1921, when the nation's total highway mileage was only 736 miles. Since then, the figure has been rising at a fast and steady rate. Just prior to the beginning of the Sino-Japanese War in 1937, China had a total highway mileage of 68,043 miles opened to motor traffic. In an interval of sixteen years, the rate of progress of road construction increased nearly one hundred times.

During the almost eight years of war, in spite of all difficulties, China has been making every effort to develop her transportation and communication systems. Although the work has been slow and difficult, these services have been steadily developed and improved. Had it not been for the war, the program of reconstruction and industrialization would have been much more expedited, according to Mo-Chih Li, Professor of Highway Engineering and Highway Transport, Na-

tional Tsing Hua University, in a paper presented before the American Road Builders' Association 42nd Annual Convention in January, 1945.

The toughest road-building problem China has been facing since the outbreak of the war is the lack of modern machinery. Hand methods are slow and costly, and in many localities labor has been scarce and the cost of living high.

Motor transport has played an important role in China's wartime transportation. In the vast southwest and northwest, where there are very few railroads and navigable rivers, highways provide practically the only means of communication. Between the time of the cutting of the French-Indo-China Railway in 1940, and the fall of Burma in 1942, China depended solely upon the Burma Road for supplies from other countries.

Immediately after the war, China should be able at least to rehabilitate 75,000 miles of highways and 12,700 miles of railways. Post-war reconstruction and industrialization in China call for, first of all, a modern and efficient

transportation and communication system; and highway transportation will play an important role.

The ultimate goal of land transportation is 100,000 miles of railways and 1,000,000 miles of highways, as originally planned by Dr. Sun Yat-Sen, the Founder of the Chinese Republic. Although it will take many years to reach this goal, these figures represent only one-third of those in the United States and are by no means fantastic, since China, on the other hand, is approximately one-third larger in area than the United States and has a population three and one-half times as large.

### Robins Conveyors Inc.

#### Elects New President

Thomas Robins, Jr., was elected President of Robins Conveyors Inc., Passaic, N. J., at a recent meeting of the Board of Directors, to succeed Thomas Matchett who had served in that office since 1928 and is now retiring from active participation in company management.

All directors of the company were re-elected.

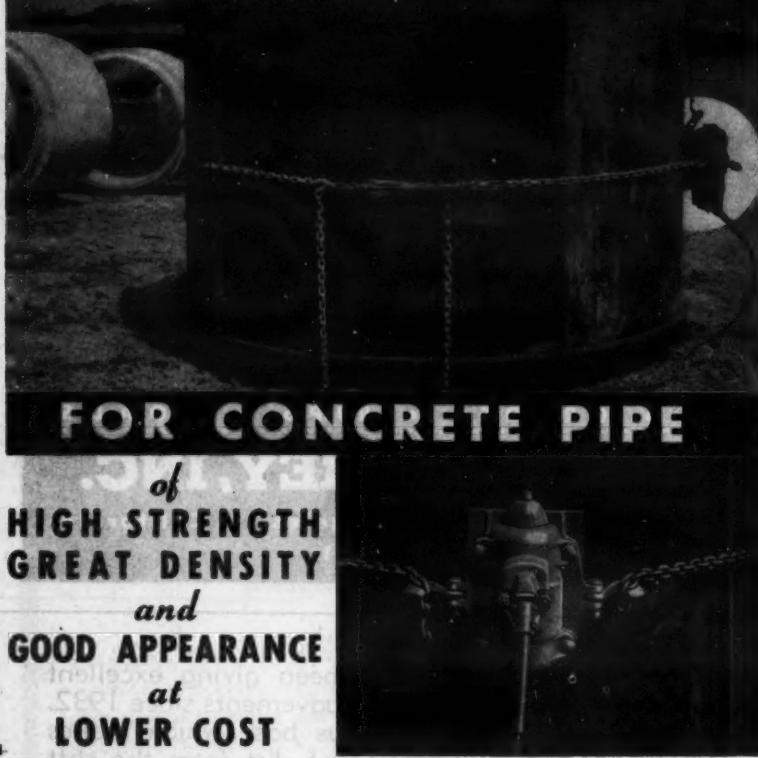
Mr. Robins has been Chairman of the Executive Committee of the company for the past five years, and is also President of the Hewitt Rubber Corp., Buffalo, N. Y., and Vice Chairman of the Board of Directors of the National Synthetic Rubber Corp., Louisville, Ky., which operates one of the Government-owned synthetic-rubber plants.

### Columbia Chemical Div.

#### Opens West Coast Office

Following the acquisition of the Pacific Alkali Co., Bartlett, Calif., the Columbia Chemical Division of the Pittsburgh Plate Glass Co., Pittsburgh, Pa., has opened an office in San Francisco. This office, established because of the increasing importance of the West Coast in the national industrial economy, will be devoted to the sale of heavy chemicals. I. G. Stewart, who has had twenty-two years' experience in the field, has been appointed Manager.

## Use JACKSON PIPE FORM VIBRATORS



Try a JACKSON Vibratory Concrete Pipe Machine and you will quickly discover that it will not only repay its cost many, many times, but also enable you to fully meet the increasingly exacting pipe specifications for impermeability and compressive strength. Stronger concrete can be produced with less cement (as less water is needed). Slumps of 1" and lower are readily placed with JACKSON machines. Spading or puddling costs are greatly reduced and forms can be stripped earlier owing to the use of less mixing water and greater consolidation. Moreover reinforcing steel can be accurately placed and held in position.

JACKSON Pipe Vibrators make possible the manufacture of highest quality plain or reinforced concrete pipe on the job, adjacent to the pipe line construction. Maximum production economies may thus be effected, with transportation costs to the laying site largely eliminated. Recommendations for practicing the VIBRO-CAST method with JACKSON Pipe Machines are yours for the asking. Write for them.

#### The Improved — Heavy Duty Model PTV-21A

A heavy duty unit for use on pipe forms from 36" to 120" diameters. 110-130 volt or 220 volt, 3 phase, 50-75 cycle, 3000-4800 VPM.



#### STANDARD Model PV-4

Best suited to pipe of 24" to 36" diameters. 110 or 130 volt, 3 phase, 50-75 cycle, A.C. 3000-4800 VPM.

**ELECTRIC TAMPER & EQUIPMENT CO.**  
LUDINGTON — MICHIGAN

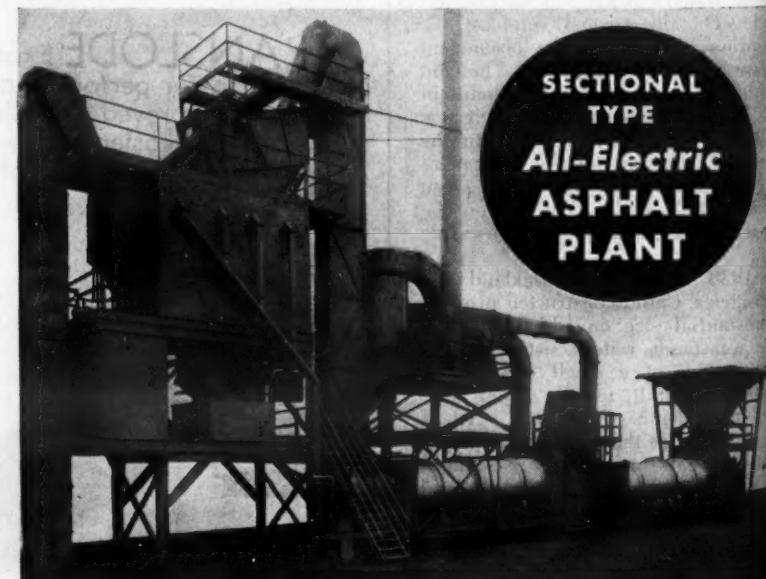
## BALANCED FLYWHEEL-FAN Another HIDDEN VALUE IN ALL WISCONSIN Air-Cooled ENGINES



Every Wisconsin Air-Cooled Engine is equipped with a high-efficiency fan that is cast integrally with the flywheel. And each of these flywheel-fans is carefully balanced on a combination balancing and boring machine which accurately locates the heavy spots by means of gravity pendulum swing . . . and then takes out the excess metal, as required. Each unit is tested for smooth, free-running balance.

Just another production detail that removes a potential source of vibration and needless wear . . . right at the source! Isn't that the kind of an engine you want on your equipment?

## WISCONSIN MOTOR Corporation MILWAUKEE 14, WISCONSIN, U. S. A. World's Largest Builders of Heavy-Duty Air-Cooled Engines

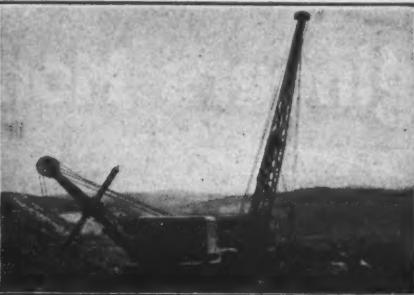


#### ELECTRICAL EQUIPMENT COMPLETELY INSTALLED

This sectional type H & B asphalt plant is completely electrical in operation, with all units driven by individual motors—no chains or countershafts. All units are wired completely at our factory. Once the plant is assembled you are ready to hook up to the power line and start operating. The plant is quickly assembled and disassembled, and easily portable. Refinements in design include a larger fan, new horizontal cyclone dust collector and new type screen, making for greater compactness and increased efficiency. Write for complete information.

HETHERINGTON & BERNER INC.  
731 Kentucky Avenue  
Indianapolis 7, Indiana





Shovel, crane, and tractor-dozer team up to salvage scrap from a Carnegie-Illinois Steel Corp. slag pile.

## Excavators, Dozers Do Big Salvage Job

A big material-handling job involving the moving of a refuse heap over a mile long and about 150 feet high was handed to Robert M. Chambers, contractor, of Turtle Creek, Pa., by the Carnegie-Illinois Steel Corp. at Gascola near Pittsburgh, Pa. This dump has been in the

process of building since 1908 and contains much salvageable material coming from slag ladle bottoms, which often must be broken up in order to go back into the furnaces. Mr. Chambers has been doing the work with a fleet of five International TD-18 diesel crawler tractors, two power shovels, and four crane-mounted magnets operated by International UD-18 diesel power units.

Much of the metal-containing slag from the ladle bottoms crumbles in small pieces and during the years has been mixed with refuse, sand, broken bricks, and various other foreign materials. To salvage all this smaller metal-containing refuse, the power shovels and the crane-operated magnets work in pairs as shown in the illustration. The shovel dipper is dumped while swinging to spread out the material, and then the magnet is moved over it, picking up the scrap which is dumped into a special pile. Later it is shoveled into motor trucks which take it to a railroad siding below. After the refuse material has been worked over by the magnet, it is pushed over the edge of the big dump by the tractors and bulldozers. The bulldozers are also used to move the material into piles to facilitate the work of the shovels and magnets.

The contractor has been working this big steel-mill dump for the past four years, salvaging much scrap which has gone into war matériel.



This 42" ARMCO Asbestos-Bonded Pipe is being installed as an outfall sewer at a war plant on the Pacific Coast.

## OUTFALL SEWERS must meet 4 tests

That outfall sewer your plant or your community will need after the war should be designed against (1) disjointing and infiltration, (2) continual maintenance and early replacement, (3) severe service conditions, and (4) obsolescence.

You get these assurances when you specify ARMCO Asbestos-Bonded Paved Invert Pipe. (1) Long, light-weight sections are securely coupled together. (2) Flexibility protects against vibration and impact. (3) An asbestos-bonded coating over galvanizing, and a thick pavement in the bottom, assure long life under even the severest conditions. (4) This pipe is removable — has salvage value.

Write for the ARMCO Sewer Book. Address Armco Drainage Products Association, 615 Curtis Street, Middletown, Ohio.



**ARMCO**

**ASBESTOS-BONDED SEWER PIPE**

## Duff-Norton Jacks

## Important Construction Tools

Essential on every construction job to do the heavy lifting, lowering, pushing and pulling, Duff-Norton Jacks give you strength, easy operation and dependability!

Duff-Norton Jacks take plenty of punishment too, and give you long years of satisfactory service. The complete Duff-Norton Catalog gives you full details on every type and size. Write for your copy.

## The Duff-Norton Manufacturing Co.

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### Duff-Norton Construction Jacks

No matter what the job may be—moving heavy machinery into place, erection of steel work, repair work—you'll find a Duff-Norton Jack to do the job. Capacities from 1 to 100 tons.

## INDEX TO ADVERTISERS

Aero Products Co.	11
Aerofrand Corp.	20
Aircraft & Diesel Equipment Corp.	20
Allis-Chalmers Tractor Div.	21
Alloy Steel & Metals Co.	49
American Cable Div.	59
American Steel Scraper Co., The	74
Anchors Coupling Co., Inc.	10
Anthony Co.	30
Ariens Co.	68
Armen Drainage Products Assn.	91
Austin-Western Co.	45
Barber-Greene Co.	81
Barco Mfg. Co.	33
Baileys Bros.	33
Bethlehem Steel Co., Inc.	68
Blackwell Mfg. Co.	10
Blitzkraft Products Co.	26
Brandt, Inc., Charles T.	24
Brooks Equipment and Mfg. Co.	34
Buylax-Erie Co.	76
Buda Co., The	41
Buffalo-Springfield Roller Co., The	94
Calcium Chloride Assn.	32
Carver Pump Co., The	32
Caterpillar Tractor Co.	16
Celotex Corp., The	14
C. H. & S. Corp.	14
Chain Bolt Co.	32
Chevrolet Motor Div.	49
Chicago Pneumatic Tool Co.	29
Clark Supply Co.	83
Cleaver-Brooks Co.	85
Cleveland Rock Drill Co., The	89
Coast Metals, Inc.	75
Complete Machy. & Equip. Co., Inc.	77
Connery Construction Co.	78
Continental Rubber Works	27
Cummer & Son Co., The F. B.	40
Davenport Boiler Corp.	22
DeBots Foundry, Inc.	82
Detroit Diesel Engine Div.	44
Dixon Valve & Coupling Co.	78
Dodge, Div. of Chrysler Corp.	20
Duff-Norton Mfg. Co., The	91
Durant Mfg. Co.	34
Edgewater Beach Hotel	88
Electric Tamper & Equip. Co.	20
Eric Steel Construction Co.	23
Euclid Road Machy. Co., The	36
Flexible Road Joint Machine Co.	87
Foots Co., The	73
Ford Motor Co.	18
Fulton Bag & Cotton Mills	23
Gallen Iron Works & Mfg. Co., The	80
Gardner-Denver Co.	74
Gas-Wood Industries, Inc.	71, 77
General Excavator Co., The	85
Goodall Rubber Co., Inc.	75
Good Roads Machy. Corp.	27
Gray Co., Inc.	84
Griffith Wallplate Corp.	38
Gulf Oil Corp.	17
Hains Mfg. Co., Inc., George	87
Hayward Co., The	29
Heil Co., The	31
Holtzclaw Steel Form & Iron Co.	38
Hetherington & Berner Inc.	90
Highway Steel Products Co.	89
Hohart Brothers Co.	81
Huber Mfg. Co., The	23
Independent Pneumatic Tool Co.	42
Inslay Mfg. Corp.	30
International Harvester Co.	72
Iowa Mfg. Co.	56
Isaachsen Iron Works	88
Jaspar Machine Co., The	10
Kinner Motors, Inc.	43
Kinney Mfg. Co.	81
Koehring Co.	85
Laclede Steel Co.	84
LaCrosse Trailer & Equip. Co.	21
LaPlant-Cheate Mfg. Co., Inc.	39
LeRoi Co.	16
LeTourneau, Inc., R. G.	92
Lewis Equipment Co., H. W.	45
Lidgerwood Mfg. Co.	23
Lima Locomotive Works, Inc.	88
Linn Mfg. Corp., The	38
Littlesford Bros., Inc.	57
Madsen Iron Works	22
Mall Tool Co.	52
Marien Steel Shovel Co., The	70
Marlin-Rockwell Corp.	34
Martin Machine Co.	45
Master Vibrator Co.	47
McCaffrey, Inc., N. P.	89
McCaffrey-Ruddock Tagline Corp.	33
McKiernan-Terry Corp.	41
Mechanics Universal Joint Div.	84
Michigan Power Shovel Co.	75
Minneapolis-Moline Power Implement Co.	16
Mixer Manufacturers Bureau	86
Mixermobile Manufacturers	21
Monarch Road Machy. Co.	72
Mondie Forge Co., Inc.	36
Murphy Diesel Co.	28
National Production Co.	84
Oliver Corp., The	11
Onan & Sons, D. W.	44
Osgood Co., The	75
Owen Bucket Co., The	20
Parsons Co., The	54
Pettibone Mulligan Corp.	83
Pioneer Engineering Works, Inc.	14
Richmond Service Anchor Co., Inc.	88
Rockford Clutch Div.	46
Rodgers Hydraulic Inc.	46
Rooth Vibrator Co.	25
Rogers Bros. Corp.	83
Rosco Mfg. Co.	24
Sagamore Derrick Co.	8
Seaman Motors Co.	73
Servicized Products Corp.	79
Shunk Mfg. Co.	88
Sinclair Refining Co.	84
Sisalcraft Co., The	84
Smith Engineering Works	29
Smith Co., The J.	87
Solvay Sales Corp.	87
Standard Oil Co. of Indiana	40
Standard Steel Corp.	19
Sterling Machinery Corp.	59
Sterling Wheelbarrow Co.	18
Sure Lite & Power Plants, Inc.	25
Templeton, Kenly & Co.	82
Texas Co.	3, 12, 15
Thaw Shovel Co., The	9
Trackson Co.	9
Truck-Lader Co.	83
Tuthill Spring Co.	79
Twin Disc Clutch Co.	48
Union Wire Rope Corp.	48, 47
United Laboratories Inc.	48
United States Motor Corp.	88
Universal Engineering Corp.	90
Vicker Equipment Co.	32
Vulcan Tool Mfg. Co.	37
Walter Motor Truck Co.	37
Ward LaFrance Truck Div.	26
Warren-Knight Co.	9
Wellman Engineering Co., The	34
White Mfg. Co., David	42
White Mfg. Co.	42
Wickwire Cooper Steel Co.	88
Wingrove Mfg. Co.	81
Wisconsin Motor Corp.	88
Wood Mfg. Co., The	85
Worthington Pump Co.	67

## new method cuts cost on Sub-Base gravel

Borrow or long haul, 2 minutes were taken to pack in 12½ to 13 pay yards of wet pit-run gravel with aid of a pusher.

Tournapull load sub-base met rigid engineer specifications. 47,000 yards of gravel were spread in 4 to 6" lifts between prepared earth forms.



### **TOURNAPULLS** load pit-run gravel, haul and spread, to increase owner profits

WITH their 400,000 cu. yd. job of grading 13 miles of U.S. 66, near Chenoa, Illinois, Raemisch - Madden Company also took 47,000 cu. yds. of gravel sub-base to be placed with their Tournapulls. Performance figures follow:

Tournapulls traveled 800' from borrow pit to main haul road, then 3 paved miles onto sub-base. Each load of gravel was spread accurately under rigid inspection in 4 to 6" lifts as needed, in a prepared earth form, leaving a layer 11' wide, 75 to 100' long. Average spreading time —  $\frac{1}{2}$  minute.

With their 12½ to 13 pay yard loads, each Tournapull completed one 6-mile cycle every half hour, averaged 25 pay yards loaded, hauled and spread-in-place per hour.

Using Tournapulls, Raemisch-Madden Company eliminated need for (1) conventional shovel loading, (2) truck hauling and (3) spreader boxes.

#### **SPEEDS CONSTRUCTION OF 13-MILE ROAD GRADING WITH 11 TOURNAPULLS**

On Raemisch-Madden's 400,000 cu. yd. grading section, time studies made after heavy rains with dirt still wet and spongy showed 10 yards average pay load. On 7800-foot cycle, averaged in 10.9 minutes, each Tournapull completed  $5\frac{1}{2}$  trips per hour . . . delivered 55 pay yards per 50-minute hour.

Contractor Raemisch says about his Tournapulls, ". . . you move more dirt faster, and that's my profit . . . so we're all for it." Check Tournapull extra profit possibilities for YOUR jobs. Drop in and see your LeTourneau distributor today.

c25

Big rubber tires (5'0"), speeds up to 14.9 m.p.h., enabled Raemisch-Madden to haul on existing pavement and to drive Tournapulls via highway from job to job.

Granulated sub-base was spread in place, eliminated need for conventional shovel, trucks and spreader boxes.

**LETOURNEAU**  
GENERAL EQUIPMENT COMPANY OF AMERICA

THE LOWEST NET COST IN THE INDUSTRY

**TOURNAPULL**

